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INTRODUCTION

72 297AA A 30 3184

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The National Aeronautics and Space Administration makes the results of worldwide research and development activities in aeronautics, space, and supporting disciplines promptly available to participants in its programs. NASA's scientific and technical information system now contains nearly a million documents, which are abstracted, indexed, and obtainable through retrieval and dissemination services. These services, which include this abstract journal, *Scientific and Technical Aerospace Reports (STAR)*, are described in a bulletin, *The NASA Scientific and Technical Information System . . . and How to Use It*, available at no charge from the NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Maryland 20740.

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By arrangement between NASA and the American Institute of Aeronautics and Astronautics, the AIAA publication *International Aerospace Abstracts (IAA)* provides parallel coverage of scientific and trade journals, books, and conference papers in the same subject areas as *STAR*. *STAR* and *IAA* are categorized and abstracted in basically identical ways, and documents in both are indexed by terms from the *NASA Thesaurus*. Both journals appear twice monthly, *IAA* being issued on the 1st and 15th of each month.

IAA is available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, NY 10017, at the following annual rates:

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Postfach 880
Federal Republic of Germany

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TYPICAL CITATIONS AND ABSTRACTS

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REPORT NUMBERS

COSATI CODE

N72-10043*# Boeing Co., Wichita, Kans.
STUDY AND DEVELOPMENT OF ACOUSTIC TREATMENT FOR JET ENGINE TAILPIPES
M. D. Nelson, L. L. Linscheid, B. A. Dinwiddie, III, and O. J. Hall, Jr. Washington NASA Nov. 1971 66 p refs
(Contract NAS1-9622)
(NASA-CR-1853; D3-8535) Avail: NTIS CSCL 01B

A study and development program was accomplished to attenuate turbine noise generated in the JT3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles. Author

PATENT CITATION

N71-33129* Collins Radio Co., Cedar Rapids, Iowa.
POWER RESPONSIVE OVERLOAD SENSING CIRCUIT Patent
Arthur P. Kubicz, inventor (to NASA) Issued 15 Jun. 1971 8 p
Filed 1 Aug. 1968 Sponsored by NASA
(NASA-Case-GSC-10667-1; US-Patent-3,585,514; US-Patent-Appl-SN-749548; US-Patent-Class-330-11; US-Patent-Class-330-24; US-Patent-Class-330-16) Avail: US Patent Office CSCL 09C

NASA CASE NO.

U.S. PATENT NO.

U.S. PATENT CLASS NUMBERS

PATENT APPLICATION CITATION

N72-10432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent Application
Robert L. McKenzie, inventor (to NASA) Filed 26 Apr. 1971 14 p
(NASA-Case-ARC-10370-1; US-Patent-Appl-SN-137391) Avail: NTIS CSCL 20E

U.S. PATENT APPLICATION SERIAL NO.

PRIMARY ANALYTIC CITATION AND ABSTRACT

N72-10856*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE GEMINI PROGRAM: PHYSICAL SCIENCES EXPERIMENTS SUMMARY
Edward O. Zeitler, comp. and Thomas G. Rogers, comp. (ITT Federal Electric Corp. Houston, Tex.) Sep. 1971 554 p refs
(NASA-TM-X-58075) Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

Results and findings of physical sciences experiments performed in the Gemini program are presented. The summary contains descriptions of selected studies in the fields of astronomy, navigation, radiation, geophysics, meteorology, photography, and communications. For individual titles, see N72-10857 through N72-10891.

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Elliott C. Morris *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75
(See N72-10856 01-30)
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VOLUME 10 NUMBER 1 / JANUARY 8, 1972

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N72-10001# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
FAST NEUTRON SPECTRUM IN THE ANALYSIS REFLECTOR OF A SWIMMING POOL REACTOR BEHIND METALLIC SLABS [SPECTRE DES NEUTRONS RAPIDES DANS LE REFLECTEUR D'UNE PILE A EAU LEGERE DERRIERE DES ECRANS METALLIQUES]
Jean-Claude Brousse (Ph.D. Thesis - Grenoble Univ.) Dec. 1970 179 p refs In FRENCH
(CEA-R-3799) Avail: AEC Depository Libraries

The experiments which were performed in the reflector of the swimming pool reactor SILOETTE, behind Pb, Al, and Fe slabs, enabled the measurement of the large perturbations introduced in the fast spectrum by these materials. The neutron slowing down chiefly depends upon the inelastic reaction. The reaction cross section increases with energy which implies a spectrum softening. An attempt was made to calculate the shape of the spectrum and to fit the measurements. Calculations were made first in a one-dimensional geometry, using the NIOBE code to solve the transport equation and also the SANE Monte Carlo code. The results did not agree with the experimental values. A semi-empirical approach and a 3-dimensional geometry was then chosen; the results obtained were in perfect agreement with the measured values. The method is described. NSA

N72-10002# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
EXPERIMENTAL STUDY OF HYPERSONIC RAREFIED FLOW OVER SLENDER CONES [EXPERIMENTELLE UNTERSUCHUNGEN AN SCHLANKEN KEGELN BEI VERDUENNTER HYPERSCHALLSTROEMUNG]
Karl Kienappel Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jun. 1971 36 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-71-30) Avail: NTIS; ZLDI Munich: 7,15 DM

Low density wind tunnel tests on slender cones are presented. Tests were made using Mach numbers 7 and 20, and Reynolds number from 1000 to 10,000 per cm. The study includes flow field, pressure, heat transfer, and force measurements. The results are compared with experimental and theoretical results of previous authors. ESRO

N72-10003# Naval Weapons Lab., Dahlgren, Va. Warfare Analysis Dept.
EFFECT OF FIN SLOTS ON THE STATIC AND DYNAMIC STABILITY CHARACTERISTICS OF FINNED BODIES
Thomas A. Clare and Peter Daniels Jun. 1971 31 p refs
(AD-728016; NWL-TR-2582) Avail: NTIS CSCL 19/1

Static and dynamic stability characteristics of a cruciform, slotted fin configuration are presented. Aerodynamic coefficients are extracted from single degree of freedom, free oscillation wind tunnel tests employing nonlinear least squares procedures. The linear and nonlinear variations with angle of attack of the restoring and damping moment coefficients are presented for various fin slot sizes at subsonic speeds. Results indicate that, as slot size increases, the nonlinear contributions decrease in magnitude to a greater extent than the linear terms. Based on the signs of the various moment contributions, it was found that, while stability is reduced at small angles of attack due to increased slot size, greater stability is affected at moderate angles of attack. Author (GRA)

N72-10004# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Porz (West Germany).
AERODYNAMIC INTERFERENCE BETWEEN AIRCRAFT AND ENGINE JET [AERODYNAMISCHE INTERFERENZ ZWISCHEN FLUGZEUG UND TRIEBWERKSSTRAHL]
Apr. 1971 312 p refs Partly in ENGLISH and partly in GERMAN Proc. of the DGLR Symp., Duesseldorf, 3 Dec. 1970
(DLR-MITT-70-28) Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

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8. FORCE AND DOWNWASH MEASUREMENTS WITH JET SIMULATION ON MODELS OF THE EUROPEAN AIRBUS IN A LOW SPEED WIND TUNNEL W. Geissler (DFVLR, Goettingen, West Ger.) 22 p refs (See N72-10012 01-02)

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11. AERODYNAMIC CALCULATIONS FOR THE INTERFERENCE OF SEVERAL PROPELLER-JETS WITH AN AEROFOIL G. Loebert (Ver. Flugtech. Werke Fokker, Munich) 43 p refs (See N72-10015 01-02)

N72-10005# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.

POSSIBILITIES FOR JET SIMULATION IN THE 3m-WIND TUNNEL OF THE DFVLR-AVA GOETTINGEN [MOEGLICHKEITEN ZUR STRAHLSIMULATION IM 3M-WINDKANAL DER DFVLR-AVA GOETTINGEN] c02

E. Melzer and R. Wulf *In* DGLR Aerodyn. Interference Between Aircraft and Engine Jet Apr. 1971 28 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)

Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

Experiments were carried out in a low speed wind tunnel to determine jet aircraft/engine interference with several aircraft models. After a discussion of the similarity parameters of engine intake and exhaust models, some possibilities of jet generation are explained, including compressed air, motor-driven fans or propellers, and the use of compressed air for ejectors of turbines. The power plants involved are described, and their possibilities and limitations are discussed. ESRO

N72-10006# Saab Aircraft Co., Linkoping (Sweden).

INTERFERENCE EFFECTS FROM JETS ON AIRCRAFT STATIC STABILITY. WIND TUNNEL METHODS USED IN SWEDEN

G. Bennich *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 16 p (See N72-10004 01-01)

Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

The development of equipment for measuring jet interference in aircraft models is described. The main object of these tests was the determination of jet interference effects on the static stability of the twin engined SAAB 105 aircraft and the single engined SAAB-37 Viggen which has an ejector type of afterbody. Special supports enabled the measurement of yaw stability for the twin-engined aircraft; the single engined model support permitted variation in angle of attack and yaw. The supply of compressed air was regulated to simulate all engine settings. ESRO

N72-10007# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge-Entwicklung.

TECHNIQUE OF PROPULSION SYSTEM SIMULATION WITH HIGH PRESSURE EJECTORS FOR SUBSONIC WIND TUNNEL MEASUREMENTS ON A FIGHTER AIRCRAFT MODEL WITH VERTICAL TAKEOFF CHARACTERISTICS [TECHNIK DER TRIEBWERKSSIMULATION MIT HOCHDRUCKEJEKTOREN BEI UNTERSCHALLWINDKANALMESSUNGEN AM MODELL EINES SENKRECHTSTARTFAEHIGEN KAMPFFLUGZEUGES] c02

W. Heinzerling *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 22 p In GERMAN (See N72-10004 01-01)

Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

A wind tunnel model of a vertical takeoff fighter aircraft was designed to cater for the normal 6 component measurements in addition to jet interference measurements. The model's engines were high pressure ejectors, driven by compressed air. A survey is given of the measurements performed to determine aerodynamic characteristics with and without interference drag. ESRO

N72-10008# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

TURBULENT AND LAMINAR JET PROPAGATION IN ROTATING SYSTEMS AND ITS APPLICATION TO JET MIXING IN THE WAKE OF REACTION DRIVEN ROTORS [TURBULENTE UND LAMINARE STRAHLAUSBREITUNG IN ROTIERENDEN SYSTEMEN UND IHRE ANWENDUNG AUF DIE STRAHLMISCHUNG IM ABWINDFELD VON ROTOREN MIT REAKTIONSANTRIEBEN] c02

R. Schmidt and J. T. Heynatz *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 37 p refs In GERMAN (See N72-10004 01-01)

Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

The kinematics and dynamic laws governing the propagation of a jet emerging from a rotating arm tip are derived for a fixed coordinate system. Using typical mixing laws for rectilinear jet propagation as an approximation, the cases of plane and round laminar and turbulent jets are compared. The spatial deviation of a jet in a rotor wake results from a further approximation. The transferability of the theoretical statements on jet propagation from one reference system to another is discussed. The principles of jet propagation in rotating systems are treated in a system of correlated coordinates. The theoretical derivations are clarified with examples of jets with temperature equal to or higher than their environment. In addition, the characteristic properties of jet propagation are experimentally investigated using smoke photographs. ESRO

N72-10009# Royal Aircraft Establishment, Farnborough (England).

SOME EXPERIMENTS ON AN ENGINE INSTALLATION ABOVE THE WING OF A SWEPT-WINGED AIRCRAFT

J. A. Bagley *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 20 p refs (See N72-10004 01-01)

(RAE-TM-AERO-1271) Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

Experiments are described for a possible large diameter turbofan engine nacelle installation above the wing of a transport aircraft. The current generation of turbofan engines for transport aircraft have nacelle diameters of about 3m, and as engine bypass ratio increases, the nacelles will become even larger. To fit such engines in the conventional position below the wings will be increasingly difficult. Tests were first made on a partial model of the wing and nacelle with the jet represented by blowing from an external supply. Interference between the jet and wing was investigated by measuring pressures on the wing, by surveys of the total-head distribution in the jet, and by schlieren and oil-flow photography. These tests were followed by force measurements in a low-speed wind tunnel on a model of a swept wing and fuselage, fitted with a pair of free-flow nacelles. The results suggest that the lift-dependent drag of such an installation may be significantly larger than that of a conventional installation below the wing. Author (ESRO)

N72-10010# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.

INFLUENCE OF A JET ON THE AERODYNAMIC

PROPERTIES OF WINGS POSITIONED ABOVE THE JET NOZZLE [EINFLUSS EINES DUESENSTRAHLS AUF DIE AERODYNAMISCHEN BEIWERTE VON UEBER DER STRAHLDUESE ANGEORDNETEN FLUEGELN]
W. Baumert and L. Harms *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 20 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

Rectangular and swept wings were investigated; position, inclination and velocity of the jet were varied. Wing and nacelle were mounted separately so that the wind tunnel balance did not measure jet thrust. A simple determination of jet interference was possible with this arrangement. The jet decreased wing lift, for the ratio of jet velocity and free stream velocity from 2 to 17 the lift loss increased linearly with the velocity ratio. The lift loss also increased with jet angle. The induced pitching moment is dependent on velocity ratio and varies with position of the jet. ESRO

N72-10011# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. Aerodynamik.
THE INFLUENCE OF AN INCLINED JET ON THE AERODYNAMIC CHARACTERISTICS OF A CONTROL SURFACE [DER EINFLUSS EINES GENEIGTEN STRAHLS AUF DIE AERODYNAMISCHEN EIGENSCHAFTEN EINES LEITWERKS]
M. Seidel *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 28 p refs In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

The variations in lift of a freestanding control surface due to a round, cold, engine jet were investigated. The most important parameter in VTOL longitudinal stability is the inclination of the jet engine to the flow direction. The measurements show that inclined incident jets result in lift losses of the control surface and thus are generally unfavorable to longitudinal stability. An empirical formula is derived for the estimation of lift loss due to jet impingement. ESRO

N72-10012# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.
FORCE AND DOWNWASH MEASUREMENTS WITH JET SIMULATION ON MODELS OF THE EUROPEAN AIRBUS IN A LOW SPEED WIND TUNNEL [KRAFT- UND ABWINDMESSUNGEN MIT TRIEBWERKSSIMULATION AN MODELLEN DES EUROPAEISCHEN AIRBUS IM NIEDERGESCHWINDIGKEITSBEREICH] c02
W. Geissler *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 22 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

Extensive wind tunnel measurements of the European airbus, including jet simulation, are reported. The jet interference influence on longitudinal stability led to repositioning of the nacelles. Simulation with the improved engine position did not indicate any reduction in jet interference, whilst bypass jet simulation showed further stability deterioration. Near ground, on the other hand, a clear improvement of longitudinal stability was observed. Further investigation at higher Reynolds numbers is necessary. ESRO

N72-10013# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Luftsaugende Antriebe.
INVESTIGATIONS OF EXHAUST JETS OF TL-ENGINE MODELS [UNTERSUCHUNGEN AN ABGASSTRAHLEN VON TL-TRIEBWERKSMODELLEN] c28
E. Schwantes *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 33 p refs In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

A systematic investigation of hot gas free jets, with an excess temperature of 550C, with critical nozzle pressure, and five differently shaped convergent nozzles is described. Large differences were noted with free jet measurements at lower nozzle Mach number. The exhaust jet emerged from the convergent nozzle with very high static overpressure, and accelerated to hypersonic speed within a core of approximately five nozzle diameters. The jet disintegration and the spatial jet propagation were less for the high speed jet than for a free jet with lower nozzle exhaust velocity due to weather turbulence. The jet propagation angle is almost the same for hot and cold jets, but thermal lifting forces resulted in a deformation of the circular cross section for horizontal hot gas jets. ESRO

N72-10014# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
CALCULATION OF THE PRESSURE DISTRIBUTION ON AN AIRCRAFT FUSELAGE WITH EMERGING LIFTING JETS USING SINGULARITIES [BERECHNUNG DER DRUCKVERTEILUNG AUF EINEM FLUGZEUGRUMPF MIT AUSTRETENDEN HUBSTRAHLEN MITTELS SINGULARITAETEN]
G. Schulz *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 36 p refs In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $3.00/MF $0.96; ZLDI Munich: 54 DM

The influence of a lifting jet perpendicular to a cylindrical aircraft fuselage is theoretically calculated. The secondary action of the jet is twofold: ambient air is drawn in as an injector, whilst the external airflow around the jet is considered as that around a solid body. The injector action is determined by a half empirical relation. The injector is represented as a line sink in potential theory. The displacing action of the jet is represented by dipole distribution on the jet axis. Both sink and dipoles cause undue disturbances near the fuselage surface by velocity components normal to the contour. These disturbances can be corrected by additional singularities. The determination of these singularities is the essential problem of the investigation. ESRO

N72-10015# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Munich (West Germany).
AERODYNAMIC CALCULATIONS FOR THE INTERFERENCE OF SEVERAL PROPELLER-JETS WITH AN AEROFOIL [BERECHNUNG DER AERODYNAMIK DES VON MEHREREN STRAHLEN BEAUFSCHLAGTEN TRAGFLUEGELS] c02
G. Loebert *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 43 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

The suitability of the lifting surface theory for V/STOL aircraft for the calculation of the aerodynamics of a wing immersed in one or more propeller slipstreams was investigated by comparison with experimental results. The comparison was conducted on the basis of lift, drag, pitching moment, normal-force distribution, and wake characteristics. The impact pressure distribution and field of direction in the airfoil wake are discussed. The influence of the main propeller-wing interference characteristics on the descent capability of propeller driven V/STOL aircraft is investigated. ESRO

N72-10016# National Physical Lab., Teddington (England). Aerodynamics Div.
BOUNDARY LAYER MEASUREMENTS ON THE WALLS OF THE NPL 13 ft BY 9 ft (4 m BY 2.7 m) LOW-SPEED WIND TUNNEL
J. L. Fulker Sep. 1970 13 p refs
(NPL-AERO-NOTE-1099) Avail: NTIS

The results from measurements of the wall boundary layers around the working section of a low speed wind tunnel are given. These results show that the floor boundary layer is somewhat thicker than the wall values, probably due to the roughness of the floor. Author (ESRO)

N72-10017# National Physical Lab., Teddington (England). Aerodynamics Div.

A WIND TUNNEL STUDY OF THE WIND LOADING ON A MODEL COOLING TOWER OF IGLOO (CIRCULAR ARC GENERATOR) FORM

R. W. F. Gould and W. G. Raymer May 1970 12 p refs
(NPL-AERO-SR-040) Avail: NTIS

The surface pressure distribution was measured on a rigid mode cooling tower shell in a uniform wind at a Reynolds number of 13,700,000 calculated on the base diameter. The full scale windspeed for buckling failure was estimated from tests on two flexible models. Limited information was obtained on the vibrational behavior of these shells in a wind. Author (ESRO)

N72-10018# National Physical Lab., Teddington (England). Aerodynamics Div.

A PROGRAMME OF RESEARCH INTO VISCOUS ASPECTS OF FLOW ON SWEPT WINGS

B. G. Thompson, G. A. Carr-Hill, and B. J. Powell (Kingston Polytech.) Sep. 1970 69 p refs
(NPL-AERO-NOTE-1100; ARC-32402; FM-4175; PERF-2947) Avail: NTIS

Current research to produce forward and inverse design programs for swept wings is described briefly. Calculations of linearized velocities, boundary layer development, and of external streamlines from surface pressures are presented. Problems affecting airfoil design and testing in viscous, nominally two-dimensional flow are also considered. Author (ESRO)

N72-10019# National Physical Lab., Teddington (England). Aerodynamics Div.

FURTHER EXPERIMENTS ON THE DRAG OF PERFORATED SHROUDS

L. R. Wootton and D. Yates Jul. 1970 22 p refs
(NPL-AERO-1321) Avail: NTIS

The load on perforated shrouds (designed to prevent vortex-induced oscillations) surrounding circular cylinders has been measured. The drag increases as the gap between the shroud and the cylinder increases, and may be a large proportion of the load taken by the combined cylinder and shroud. Author (ESRO)

N72-10020# National Physical Lab., Teddington (England). Aerodynamics Div.

SOME EXPERIMENTS ON A WIND TUNNEL WALL BOUNDARY LAYER BLEED AT HIGH SUBSONIC SPEEDS

D. J. Hall and V. G. Quincey Sep. 1970 14 p ref
(NPL-AERO-NOTE-1093; ARC-32357; FM-4171; PERF-2939) Avail: NTIS

Experiments on a localized two-dimensional boundary layer bleed on the sidewalls of a transonic wind tunnel with slotted roof and floor are described. The slotted walls are shown to have a powerful alleviating effect upon the disruption of the tunnel longitudinal pressure gradient that such a bleed system tends to produce. Author (ESRO)

N72-10021# National Physical Lab., Teddington (England). Aerodynamics Div.

A NOTE ON SUBSONIC LINEARISED THEORY FOR SYMMETRICAL CRANKED WINGS AT ZERO-INCIDENCE

R. C. Lock Jul. 1970 17 p refs
(NPL-AERO-NOTE-1090; ARC-32225; FM-4157; PERF-2921) Avail: NTIS

Formulae are given for the streamwise and spanwise components of perturbation velocity due to thickness, as predicted by subsonic linearized theory, in the neighborhood of the crank formed by the junction of two semi-infinite swept wings of different sweep angles. The implications of these formulae for the magnitude of the crank effect are discussed qualitatively, including the influence of free stream Mach number. Author (ESRO)

N72-10022# National Physical Lab., Teddington (England). Aerodynamics Div.

SEPARATION MEASUREMENTS ON A DELTA WING IN A SHOCK TUNNEL AT M = 8.6 USING MONOCHROME AND COLOUR-SCHLIEREN PHOTOGRAPHY

R. F. Cash and A. M. Catley Sep. 1970 14 p refs Original contains color illustrations
(NPL-AERO-NOTE-1097; ARC-32399) Avail: NTIS

The measurements were made on a 76 deg swept delta wing in a 400 mm (16 in) shock tunnel and the free stream Reynolds number was 49,000 cm (125,000 in) for stagnation conditions of 150 atmospheres and 2000 K. A series of schlieren photographs of the established separated flow, induced by spanwise steps and wedges fixed at the rear of the model, were taken in monochrome and color. The technique, equipment, and the relative merits of the two systems are discussed in detail. Author (ESRO)

N72-10023# National Physical Lab., Teddington (England). Aerodynamics Div.

THE MECHANICAL DESIGN OF AN ADJUSTABLE NOZZLE FOR THE NPL 25 in BY 20 in (635 mm BY 508 mm) TRANSONIC WIND TUNNEL

N. G. Marcus Sep. 1970 28 p refs
(NPL-AERO-NOTE-1098; ARC-32400) Avail: NTIS

A description is given of the mechanical engineering design of a pair of steel flexible liners. These are positioned by simple motorized jack systems which easily adjust the flexible nozzle to control the tunnel Mach number. The aerodynamic loading, calculations, and design features are discussed. Author (ESRO)

N72-10024# National Physical Lab., Teddington (England). Environmental Unit.

A LINEAR THEORY FOR THE FLUCTUATING DRAG OF SIMPLE STRUCTURES IN TURBULENT FLOW

J. B. Roberts Mar. 1971 37 p refs
(NPL-AERO-1329) Avail: NTIS

An approach was developed for predicting the drag spectrum of simple structures in turbulent flow. Expressions which directly relate the drag spectrum to the wave number spectrum of the turbulence are derived and the special case of isotropic turbulence is examined in some detail. For the case of a disk lattice in isotropic flow it has been possible to express the drag spectrum analytically. The theoretical drag spectra of a disk lattice and a square lattice are shown to collapse when scaled on an area basis. Comparisons are made between the present theoretical results, previous theoretical results, and experimental results on flat plates. Author (ESRO)

N72-10025*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF CASING TREATMENT ON OVERALL AND BLADE ELEMENT PERFORMANCE OF A COMPRESSOR ROTOR

Royce D. Moore, George Kovich, and Robert J. Blade Washington Nov. 1971 65 p refs
(NASA-TN-D-6538; E-6119) Avail: NTIS CSCL 20D

An axial flow compressor rotor was tested at design speed with six different casing treatments across the rotor tip. Radial surveys of pressure, temperature, and flow angle were taken at the rotor inlet and outlet. Surveys were taken at several weight flows for each treatment. All the casings treatments decreased the weight flow at stall over that for the solid casing. Radial surveys indicate that the performance over the entire radial span of the blade is affected by the treatment across the rotor tip. Author

N72-10026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL INVESTIGATION OF THE PERFORMANCE OF VORTEX GENERATORS MOUNTED IN THE SUPERSONIC PORTION OF A MIXED-COMPRESSION INLET

Glenn A. Michell Washington Nov. 1971 37 p refs
(NASA-TM-X-2405; E-6418) Avail: NTIS CSCL 20D

Vortex generators were investigated as a means of controlling the throat boundary layer in a Mach 2.5 mixed-compression inlet. With or without throat bleed, the generators were unable to produce the inlet peak recoveries available with good performance bleed. Generators placed on the unbled inlet centerbody ahead of the cowl shock impingement point degraded inlet performance. Generators placed further aft on the unbled centerbody, but ahead of the throat, improved inlet performance at conditions where the terminal shock could cause boundary layer separation. Adding generators to the inlet with throat bleed reduced performance. Bleed aft of the generators degraded the vortex flow field. Author

N72-10027# Boston Univ., Mass. Engineering Labs.

AN INVESTIGATION OF VORTEX PATH AND STRENGTH OF FINNED MISSILES AT HIGH ANGLE OF ATTACK AND NUMERICAL CALCULATION OF INDUCED ROLLING MOMENT Interim Labs.

Charles S. W. Wong Mar. 1971 73 p refs
(Contract F19628-68-C-0148; Proj. 7659)
(AD-725061; AFCRL-71-0092; SR-2) Avail: NTIS CSCL 19/1

The vortex paths and strengths generated by finless, planar and cruciform missiles have been measured in the subsonic wind tunnel. Measurements for the finless missile were taken at wind tunnel speeds of 70 and 100 m.p.h. and at angles of attack of 10, 15, 20 degrees. The planar and cruciform missile measurements were taken at wind tunnel speeds of 70 m.p.h. with angles of attack of 15 and 20 degrees for the planar fin and 15 degrees for the cruciform fin. Computer program results have been generated for the vortex induced rolling moment on a missile with planar fins at a high angle of attack with the input vortex positions and strengths taken from the results of this report. Author (GRA)

N72-10028# Boston Univ., Mass. Engineering Labs.

VORTEX INDUCED ROLLING MOMENTS ON CRUCIFORM MISSILES AT HIGH ANGLE OF ATTACK Interim Report

Steven I. Kane Mar. 1971 66 p refs
(Contract F19628-68-C-0148, AF PROJ. 7659)
(AD-724723; AFCRL-71-0093; SR-3) Avail: NTIS CSCL 19/7

The problem of predicting the induced roll phenomena associated with finned missiles at high angles of attack has been approached by examining the interaction between the body wake vortex system and the finned surfaces of the missile. The application of the classic Blasius moment integral to this problem permits the independent evaluation of each singularity in the flow field which may contribute to the moments. This method is applicable to missiles employing fin schemes of any geometry and is used herein to analyze the induced roll of a typical cruciform missile configuration. A computer program has been developed to generate numerical solutions utilizing those parameters which affect the magnitude and direction of the induced roll. Author (GRA)

N72-10029# Boston Univ., Mass. Engineering Labs.

UNSTEADY CONTRIBUTION TO VORTEX INDUCED ROLLING MOMENT ON PLANAR FINNED VEHICLES AT HIGH ANGLE OF ATTACK Final Report, 1 Jan. 1968 - 31 Dec. 1970

Daniel G. Udelson Mar. 1971 35 p refs
(Contract F19628-68-C-0148; AF PROJ. 7659)
(AD-724725; AFCRL-71-0095) Avail: NTIS CSCL 19/7

A solution is found for the unsteady contribution to rolling moment on long cylindrical bodies with planar fins under ideal flow conditions due to vortices which are formed on the body at high angle of attack and washed past the fins at the tail. This contribution must be added to the steady state solution which was obtained in an earlier work. The theoretical development employs the classical Blasius contour integral. Author (GRA)

N72-10030# Boston Univ., Mass. Engineering Labs.

TURBULENCE INDUCED ROLLING MOMENTS ON FINNED VEHICLES Interim Report

Daniel G. Udelson Mar. 1971 32 p refs
(Contract F19628-68-C-0148; Proj. AF-7659)
(AD-724724; AFCRL-71-0094; SR-4) Avail: NTIS CSCL 19/7

Expressions are derived for the rolling moment on long cylindrical finned missiles moving through a turbulent fluid at zero angle of attack. The moment is a function of the time average and fluctuating velocity components in the turbulent boundary layer of the vehicle. Solutions for these velocities are found from the Reynolds' momentum equations by making suitable assumptions, and contain parameters which must be determined experimentally. Author (GRA)

N72-10031*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FULL-SCALE WIND-TUNNEL TESTS OF A SMALL UNPOWERED JET AIRCRAFT WITH A T-TAIL

Paul T. Soderman and Thomas N. Aiken Washington Nov. 1971 99 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab.
(NASA-TN-D-6573; A-3135) Avail: NTIS CSCL 01A

The aerodynamic characteristics of a full scale executive type jet transport aircraft with a T-tail were investigated in a 40 x 80 ft (12.2 by 24.4 meter) wind tunnel (subsonic). Static, longitudinal, and lateral stability, and control characteristics were determined at angles of attack from -2 deg to +42 deg. The aircraft wing had 13 deg of sweep and an aspect ratio of 5.02. The aircraft was tested power off with various wing leading- and trailing-edge high lift devices. The basic configuration was tested with and without such components as engine nacelles, wing tip tanks, and empannage. Hinge-moment data were obtained and downwash angles in the horizontal-tail plane location were calculated. The data were obtained at Reynolds numbers of 4.1 million and 8.7 million based on mean aerodynamic chord. The model had static longitudinal stability through initial stall. Severe tail buffett occurred near the angle of attack for maximum lift. Above initial stall the aircraft had pronounced pitch-up, characteristic of T-tail configurations. A stable trim point was possible at angles of attack between 30 deg and 40 deg (depending on c.g. location and flap setting). Hinge-moment data showed no regions with adverse effects on stick force. Comparisons of wind-tunnel data and flight-test are presented. Author

N72-10032 National Lending Library for Science and Technology, Boston Spa (England).

A NOMOGRAM FOR DETERMINING THE REYNOLDS NUMBER

V. V. Sterligov 1971 5 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), no. 4, 1971 p 147-148
(NLL-M-21098-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method of plotting and using a nomogram for determining the Reynolds number is given. It can be used for determining modelling conditions, calculating the aerodynamics of furnaces, and other purposes. Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N72-10033*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTIPLE FAN INTEGRATED PROPULSION WING SYSTEM Patent Application
Roger W. Luidens, inventor (to NASA) Filed 21 Jun. 1971 14 p
(NASA-Case-LEW-11224-1; US-Patent-Appl-SN-154934) Avail: NTIS CSCL 01B

A system for directing air against the wing flaps of STOL aircraft to produce both lift and forward thrust is described. Airpumps provide high pressure air to small tip turbine fans disposed spanwise under the wings and forward of the flaps; the fans then direct the air against the flaps to produce the lift and thrust. J.G.M.

N72-10034# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
PRELIMINARY TESTS AND PERFORMANCE OF ROLLING VERTICAL TAKEOFF AND LANDING OF THE VJ 101 C-X2 WITH IGNITED AFTERBURNERS [VORUNTERSUCHUNGEN UND DURCHFUEHRUNG VON ROLLENDEN SENKRECHTSTARTS UND -LANDUNGEN MIT DER VJ 101 C-X2 MIT GEZUENDETEN NACHBRENNERN]
O. Richarz, H. Heidrich, and V. Zeidler Bonn Bundeswehramt 1971 38 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-71-13) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

A special takeoff and landing procedure, termed RVTOL (rolling vertical takeoff and landing), was developed for the VTOL aircraft VJ 101 C-X2. The RVTOL technique is believed to be an answer with this type of aircraft to the problems of recirculation, ground erosion, airframe thermal stress, and controllability. Almost complete independence from conventional ground equipment is claimed, due to the reliable operation of the three-channel flight control system. ESRO

N72-10035# National Physical Lab., Teddington (England). Environmental Unit.
A NEW BASIS FOR AIRCRAFT NOISE RATING
D. W. Robinson Mar. 1971 23 p refs
(NPL-Aero-Ac-49) Avail: NTIS

Starting with the definition of noise pollution level, it is shown that the incremental value of this quantity due to the occurrence of an aircraft noise provides a logical basis for rating the noise. This measure has simple additive properties which permit the same definition to be extended to an arbitary series of events, including the background noise and its fluctuations. By specifying reference values of certain parameters, a formula is evolved which is suitable for aircraft noise certification purposes; the relation of this measure to effective perceived noise level is discussed. Author (ESRO)

N72-10036# Defense Documentation Center, Alexandria, Va.
NOISE POLLUTION - AIRPLANE NOISE, VOLUME 1 Bibliography, Aug. 1947 - Dec. 1970
Jun. 1971 147 p refs 2 Vol.
(AD-724850; DDC-TAS-71-26-1) Avail: NTIS CSCL 20/1

The annotated bibliography is an unclassified compilation of references on airplane noise pollution in a series of bibliographies on environmental pollution. References deal primarily with effects of noise exposure on hearing, speech, communications and community/airport noise. Computer-generated indexes for corporate author-monitoring agency, subject, and title are included. requesting AD-722 910. Author (GRA)

N72-10037# Naval Ship Research and Development Center, Washington, D.C. Aviation and Surface Effects Ratios.
THEORETICAL PERFORMANCE OF A PURE JET FLAP ROTOR AT HIGH ADVANCE RATIOS
Robert M. Williams and Charles L. Bernitt Dec. 1970 49 p refs
(Proj. WF32.421.202)
(AD-726706; TN-AL-189) Avail: NTIS CSCL 01/3

The theoretical performance of a jet flap rotor at advance ratios greater than 1.0 is examined. The rotor is four bladed with purely elliptical airfoils of fifteen percent thickness ratio. Each airfoil has two plenum chambers which supply air to slots located beneath the leading and trailing edges, respectively. The rotor operates in cruise at advance ratios greater than unity so that the retreating blade is immersed in reverse flow. The lift and moments are controlled by ejecting a jet sheet out of the trailing edge on the advancing side of the azimuth and both the leading and trailing edge on the retreating side of the azimuth. Standard blade element theory is used to calculate jet flap rotor performance thrust coefficients representative of actual full-scale rotor operation. It is shown that good performance can be obtained using the jet flap and that substantially better performance can be achieved using a circulation control airfoil. Author (GRA)

N72-10038# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF ACCIDENTS INVOLVING AMATEUR/HOME BUILT AIRCRAFT: US GENERAL AVIATION
Jun. 1971 44 p
(PB-201438; NTSB-AMM-71-2) Avail: NTIS CSCL 01B

The publication contains statistical, cause/factor and injury tables, accident rates and the briefs of accidents involving amateur built aircraft. Author (GRA)

N72-10039# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF ACCIDENTS INVOLVING WEATHER AS A CAUSE RELATED FACTOR: US GENERAL AVIATION, 1968
Jun. 1971 196 p
(PB-201437; NTSB-AMM-71-1) Avail: NTIS CSCL 01B

The publication contains statistical, cause/factor and injury tables, accident rates and the briefs of accidents involving weather. Author (GRA)

N72-10040# Quality Assurance Directorate (Materials), London (England).
THE INFRA-RED ANALYSIS OF AIRCRAFT CABIN-GAS ATMOSPHERES
D. J. Bishop and J. K. Corbett Oct. 1970 31 p refs
(QAD-MATS-174) Avail: NTIS

The analysis of the air-bleed cabin gas produced by Olympus and Pegasus engines has been carried out by infra-red spectrometry. The method utilizes a conventional double beam recording infra-red spectrophotometer equipped with a pair of multireflection long path cells. The lower limits of detection of the various contaminants listed in the specification have been determined both individually and in conjunction with large amounts of other impurities. This method has also been extended to cover air-bleed cabin gas samples which have been taken from development engines in which malfunctions of the engine components have been simulated. Author (ESRO)

N72-10041# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
BRIEFS OF AIRCRAFT ACCIDENTS INVOLVING MISSING AIRCRAFT: US GENERAL AVIATION, 1968
Jun. 1971 92 p
(NTSB-AMM-71-4; PB-201440) Avail: NTIS CSCL 01B

The publication contains statistical cause/factor and injury tables, accident rates and the briefs of accidents involving missing aircraft. Author (GRA)

N72-10042# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
OPTIMIZATION STUDIES OF AIRCRAFT CONTROL

VARIABLES
Mario Caluda, G. D. Wahitehouse, and A. J. McPhate May 1971 144 p refs
(Contract F44620-68-C-0021; AF Proj. 7921; Proj. THEMIS)
(AD-725069; THEMIS-LSU-T-TR-45; AFOSR-71-1798TR) Avail: NTIS CSCL 01/3

The feasibility of using an adaptive linear mathematical model to represent a human operator subjected to the task of controlling an attacking fighter aircraft was investigated. The ability of the model to perform pursuit tracking tasks subject to random evader tactics was analyzed by the implementation of the model into a six-degree-of-freedom digital fire control simulation. For the model to approach reality in every flight regime, an adaptive procedure was incorporated into the simulation in every flight regime, and an adaptive procedure was incorporated into the simulation to adjust the variable gain and lead time parameters of the human model. The adaptive procedure which uses a six parameter optimization scheme similar to that developed by M. J. D. Powell achieves the desired pursuit tracking results in the most direct way. As a means of evaluating the simulated performance of the human operator when performing this task, the performance data of the attacking aircraft was subjected to a number of spectral analysis operations. These spectral operations compared the frequency content of the data obtained from the simulation to actual data obtained from combat flight maneuvers. For both sets of data the evaders performed the same identical tactics. Author (GRA)

N72-10043*# Boeing Co., Wichita, Kans.
STUDY AND DEVELOPMENT OF ACOUSTIC TREATMENT FOR JET ENGINE TAILPIPES
M. D. Nelson, L. L. Linscheid, B. A. Dinwiddie, III, and O. J. Hall, Jr. Washington NASA Nov. 1971 66 p refs
(Contract NAS1-9622)
(NASA-CR-1853; D3-8535) Avail: NTIS CSCL 01B

A study and development program was accomplished to attenuate turbine noise generated in the JT3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles. Author

N72-10044# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
INVESTIGATION OF DISPLAY REQUIREMENTS FOR HELICOPTER IFR MANUAL FORMATION FLIGHT UNDER VARIOUS OPERATIONAL AND ENVIRONMENTAL CONDITIONS Final Report, Aug. 1969 - Jun. 1970
Myrna L. Toivanen, Paul A. Anderson, and S. R. Hollingsworth Apr. 1971 199 p refs
(Contract N00014-66-C-0362; NR Proj. 213-054)
(AD-725209; JANAIR-700911; Rept-12543-FR6) Avail: NTIS CSCL 01/4

Systematic man-in-the-loop simulations were conducted to evaluate pilot/system performance in the manually controlled IFR SK/FF task for the UH-1 helicopter under various operational and environmental conditions. Interpreted within the constraints imposed upon and by the simulations, the empirical results indicated that leader heading, even when perturbed by lateral gusts, was an adequate system reference; 250-2000 feet were acceptable separation distances for fixed-formation maneuvers; there were no significant performance differences between the leader or follower frame of reference; the pursuit guidance technique was applicable to the rendezvous phase; display augmentation was not required during the rendezvous, but it reduced the difficulty of the control task and improved performance; the formation grouping concept was feasible from the standpoint of display/control considerations; and the trajectory-following and pursuit guidance control techniques were both suitable for providing control commands to the pilot for formation grouping, although trajectory-following yielded better performance and pursuit guidance was easier to mechanize. Author (GRA)

N72-10045*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC CHARACTERISTICS OF AN ALL-BODY HYPERSONIC AIRCRAFT CONFIGURATION AT MACH NUMBERS FROM 0.65 TO 10.6
Walter P. Nelms, Jr. and Charles L. Thomas Washington Nov. 1971 100 p refs
(NASA-TN-D-6577; A-4017) Avail: NTIS CSCL 01B

Aerodynamic characteristics of a model designed to represent an all body, hypersonic cruise aircraft are presented for Mach numbers from 0.65 to 10.6. The configuration had a delta planform with an elliptic cone forebody and an afterbody of elliptic cross section. Detailed effects of varying angle of attack (-2 to +15 deg), angle of sideslip (-2 to +8 deg), Mach number, and configuration buildup were considered. In addition, the effectiveness of horizontal tail, vertical tail, and canard stabilizing and control surfaces was investigated. The results indicate that all configurations were longitudinally stable near maximum lift drag ratio. The configurations with vertical tails were directionally stable at all angles of attack. Trim penalties were small at hypersonic speeds for a center of gravity location representative of the airplane, but because of the large rearward travel of the aerodynamic center, trim penalties were severe at transonic Mach numbers. Author

N72-10046# Army Foreign Science and Technology Center, Charlottesville, Va.
HELICOPTER AERODYNAMICS
D. I. Bazov 14 May 1971 224 p refs Transl. into ENGLISH of the book "Aerodinamika Vertoletov" Moscow, Transport Publishing House, 1969 p 1-196
(Proj. T702301-2301)
(AD-726841; FSTC-HT-23-549-71; ACSI-J-9360) Avail: NTIS CSCL 01/1

The principles of helicopter flight, special characteristics of the main rotor and its function in autorotation axial and oblique flow, regimes of vertical and horizontal flight, climb and descent, takeoff and landing, balance, stability and control of the helicopter and their acting aerodynamic forces are presented. Author (GRA)

N72-10047# Grumman Aerospace Corp., Bethpage, N.Y.
AN AUTOMATED PROCEDURE FOR THE OPTIMIZATION OF PRACTICAL AEROSPACE STRUCTURES. VOLUME 2: TECHNICAL PROGRAMMER'S MANUAL Final Report, 15 Jan. 1969 - 15 Aug. 1970
Walter J. Dwyer, Robert K. Emerton, and Irving V. Ojalvo Wright-Patterson AFB, Ohio AFFDL Apr. 1971 107 p
(Contract F33615-69-C-1278)
(AD-725744; ADR-02-01-71-Vol-2; AFFDL-TR-70-118-vol-2) Avail: NTIS CSCL 01/3

The report documents the computer programs described in Volume I of this report entitled 'An Automated Procedure for the Optimization of Practical Aerospace Structures' (AD-726112). Both the main structural optimization program and the shell dynamics program are written in Fortran 4 language. This manual contains a description of the overlay structure, data set arrangement, and subroutines of both programs. Author (GRA)

N72-10048# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
THE GENERATION OF A MILITARY SPECIFICATION FOR FLYING QUALITIES OF PILOTED V/STOL AIRCRAFT MIL-F-83300 Final Report, Apr. 1966 - Mar. 1971
David L. Key Wright-Patterson AFB, Ohio AFFDL Apr. 1971 41 p refs
(Contracts AF 33(615)-3736; F33615-70-C-1322; AF Proj. 698DC)
(AD-725746; CAL-BB-2925-F-1; AFFDL-TR-21-23) Avail: NTIS

CSCL 01/3

The document describes a four year effort which led to the adoption of a new military specification MIL-F-83300, 'Flying Qualities of Piloted V/STOL Aircraft', and the publication of a supporting document, 'Background Information and User Guide for MIL-F-83300, Military Specification - Flying Qualities of Piloted V/STOL Aircraft' (AFFDL-TR-70-88). Included in the report is an assessment of the status of V/STOL flying qualities research and recommendations for future work. Author (GRA)

N72-10049# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: SOUTHERN AIRWAYS, INCORPORATED, DOUGLAS DC-9-15, N92A, GULFPORT, MISSISSIPPI, 17 FEBRUARY 1971
1 Sep. 1971 22 p
(NTSB-AAR-71-14) Avail: NTIS

On February 17, 1971, DC-9-15 aircraft struck an electric transmission line static cable during a VOR approach to Runway 31 at the Gulfport, Mississippi, Municipal Airport. A successful missed approach was accomplished, and the aircraft landed at Gulfport. Of the seven passengers and four crew aboard the aircraft, the only reported injury was a passenger's scratched hand. The aircraft received substaintial damage to the left main landing gear, left wing, left fuselage, and the left engine. There was no fire. The weather was a partial obscuration with visibility 3/4 mile in fog. The probable cause of this accident was inadequate monitoring of the approach. The captain was preoccupied with the prelanding checklist during the final approach, and the first officer, who was flying the aircraft, was devoting his attention to an attempt to establish visual contact with the runway in low visibility. These activities resulted in an improperly executed VOR/DME approach during which the aircraft descended below the minimum descent altitude before the crew acquired visual contact with the runway environment. Author

N72-10050# East Central Florida Regional Planning Council, Winter Park.
METROPOLITAN AIRCRAFT NOISE ABATEMENT POLICY STUDY: CAPE KENNEDY REGIONAL AIRPORT, MELBOURNE, FLORIDA
Jun. 1971 134 p refs
(PB-201195; ECFRPC-71-2) Avail: NTIS CSCL 13B

The report is an analysis of the relationship between noise generated by aircraft operations and the use of affected land surrounding the airport in Melbourne, Florida. It includes a presentation of current land use information and the prospects for change. Proposals were developed to encourage and enable the local governments involved to achieve compatible development through cooperative intergovernmental measures: comprehensive planning, capital improvement programming, mapping, zoning, annexation, land acquisition. The ecological impact is considered in a separate section. Author (GRA)

N72-10005# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.
POSSIBILITIES FOR JET SIMULATION IN THE 3m-WIND TUNNEL OF THE DFVLR-AVA GOETTINGEN [MOEGLICHKEITEN ZUR STRAHLSIMULATION IM 3M-WINDKANAL DER DFVLR-AVA GOETTINGEN]
E. Melzer and R. Wulf *In* DGLR Aerodyn. Interference Between Aircraft and Engine Jet Apr. 1971 28 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

N72-10007# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge-Entwicklung.
TECHNIQUE OF PROPULSION SYSTEM SIMULATION WITH HIGH PRESSURE EJECTORS FOR SUBSONIC WIND TUNNEL MEASUREMENTS ON A FIGHTER AIRCRAFT MODEL WITH VERTICAL TAKEOFF CHARACTERISTICS [TECHNIK DER TRIEBWERKSSIMULATION MIT HOCHDRUCKEJEKTOREN BEI UNTERSCHALLWINDKANALMESSUNGEN AM MODELL EINES SENKRECHTSTARTFAEHIGEN KAMPFFLUGZEUGES]
W. Heinzerling *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 22 p In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

N72-10008# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
TURBULENT AND LAMINAR JET PROPAGATION IN ROTATING SYSTEMS AND ITS APPLICATION TO JET MIXING IN THE WAKE OF REACTION DRIVEN ROTORS [TURBULENTE UND LAMINARE STRAHLAUSBREITUNG IN ROTIERENDEN SYSTEMEN UND IHRE ANWENDUNG AUF DIE STRAHLMISCHUNG IM ABWINDFELD VON ROTOREN MIT REAKTIONSANTRIEBEN]
R. Schmidt and J. T. Heynatz *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 37 p refs In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

N72-10012# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.
FORCE AND DOWNWASH MEASUREMENTS WITH JET SIMULATION ON MODELS OF THE EUROPEAN AIRBUS IN A LOW SPEED WIND TUNNEL [KRAFT- UND ABWINDMESSUNGEN MIT TRIEBWERKSSIMULATION AN MODELLEN DES EUROPAEISCHEN AIRBUS IM NIEDERGESCHWINDIGKEITSBEREICH]
W. Geissler *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 22 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

N72-10015# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Munich (West Germany).
AERODYNAMIC CALCULATIONS FOR THE INTERFERENCE OF SEVERAL PROPELLER-JETS WITH AN AEROFOIL [BERECHNUNG DER AERODYNAMIK DES VON MEHREREN STRAHLEN BEAUFSCHLAGTEN TRAGFLUEGELS]
G. Loebert *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 43 p refs In GERMAN; ENGLISH summary (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N72-10051*# Tyco Labs., Inc., Waltham, Mass.
RESEARCH ON RECHARGEABLE OXYGEN ELECTRODES
J. Giner, P. A. Malachesky, and G. Holleck Jun. 1971 236 p refs
(Contract NAS3-13234)
(NASA-CR-72999; C-958) Avail: NTIS CSCL 10C

Studies were carried out on a number of factors which may influence the behavior of the platinum electrocatalyst of oxygen electrodes for use in rechargeable metal-oxygen batteries or hydrogen-oxygen fuel cells. The effects of pretreatments for various potentials and added ionic species, which could be present in such systems, were studied with reguard to: (1) the state of surface oxidation, (2) platinum dissolution, (3) the kinetics of oxygen evolution and reduction (including the role of hydrogen peroxide), and (4) changes in porous electrode structure. These studies were carried out on smooth platinum, platinized platinum, and Teflon-bonded platinum black electrodes in carefully purified electrolyte solutions. The main factors which appear to affect rechargeable oxygen electrode performance and life are: (1) the buildup of a refractory anodic layer on extended cycling, and (2) the dissolution of platinum. Author

N72-10052*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PROCEEDINGS OF THE FOURTH ANNUAL CONFERENCE ON EFFECTS OF LITHIUM DOPING ON SILICON SOLAR CELLS
P. A. Berman, ed. 15 Sep. 1971 118 p refs Conf. held at Pasadena, Calif., 29 Apr. 1971
(Contract NAS7-100)
(NASA-CR-122850; JPL-TM-33-491) Avail: NTIS CSCL 10B

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9. EXPERIMENTAL AND COMPUTER STUDIES OF THE RADIATION EFFECTS IN SILICON SOLAR CELLS R. E. Leadon, J. A. Naber, and B. C. Passenheim (Gulf Radiation Technol.) p 71-80 refs (See N72-10058 01-03)
10. HALL EFFECT STUDY OF ELECTRON IRRADIATED Si(Li) J. Stannard (Naval Res. Lab., Washington, D. C.) p 81-84 refs (See N72-10059 01-03)
11. THE OBSERVATION OF STRUCTURAL DEFECTS IN NEUTRON-IRRADIATED LITHIUM-DOPED SILICON SOLAR CELLS G. A. Sargent (Kentucky Univ.) p 85-90 refs (See N72-10060 01-03)
12. RADIATION DAMAGE AND ANNEALING OF LITHIUM-DOPED SILICON SOLAR CELLS R. L. Statler (Naval Res. Lab., Washington, D. C.) p 91-98 refs (See N72-10061 01-03)
13. RADIATION DAMAGE ANNEALING KINETICS M. S. Dresselhaus (Massachusetts Inst. of Technol., Cambridge, Mass.) p 101-103 refs (See N72-10062 01-03)

N72-10053*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOME MAJOR RESULTS OF THE FOURTH ANNUAL CONFERENCE ON EFFECTS OF LITHIUM DOPING ON SILICON SOLAR CELLS
P. A. Berman *In its* Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 1-3
(See N72-10052 01-03)
Avail: NTIS CSCL 10B

Lithium doped silicon solar cells having dimensions as large as 12 sq cm are now possible, due to significantly improved boron-diffusion techniques. A large increase was observed in the short circuit current measured in tungsten light for cells that were fabricated using the improved diffusion techniques as compared with previous cells, indicating a preservation of minority carrier diffusion length in the base region of the former cells. Sintering of the contacts of lithium doped cells fabricated from Lopex silicon resulted in large increases in maximum power, mostly due to an open circuit voltage improvement, over non-sintered cells. Efficiencies as high as 12.8% were observed, with the average efficiency being about 11.9%. Author

N72-10054*# Heliotek, Sylmar, Calif.
LITHIUM-DOPED SOLAR CELLS FOR SPACE USE
P. Payne and E. L. Ralph *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 5 Sep. 1971 p 4-12 ref Prepared for JPL (See N72-10052 01-03)
(Contract JPL-952547)
Avail: NTIS CSCL 10B

Lithium doped p-n solar cells meet the basic requirements for space use. The efficiencies of the Lopex lithium cells which range from 10.5 to 12.8% are equal to or better than C.G. lithium cell and 10 ohms-cm n-p cell efficiencies. Reduction in the stresses introduced during boron diffusion has eliminated cell size restrictions and both 2 x 2 and 2 x 6 cm lithium doped cells have been fabricated. The Ti-Ag contacts which are tested 100% with a tape peel test, and pull tested and humidity tested on a sample basis are comparable to the Ti-Ag contacts on n-p cells. Author

N72-10055*# Globe-Union, Inc., El Monte, Calif.
DEVELOPMENT AND FABRICATION OF LITHIUM-DOPED SOLAR CELLS
P. A. Iles *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 13-30 refs Prepared for JPL (See N72-10052 01-03)
(Contract JPL-952546)
Avail: NTIS CSCL 10B

The application of contacts and coatings after lithium diffusion provides good electrical output and satisfactory contact adhesion by sintering for short times at temperatures less than the lithium diffusion temperature. High output and repeatability are obtainable from both oxygen-rich and oxygen-lean silicon. These fabrication sequence alterations have led to higher cell output, better appearance, and increased contact strength. Author

N72-10056*# Ion Physics Corp., Burlington, Mass.
AIR FORCE/ION PHYSICS HARDENED LITHIUM DOPED SOLAR CELL DEVELOPMENT
A. Kirkpatrick, F. Bartels, C. Carnes, J. Ho, and D. Smith *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 31-34 (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Introduction of lithium by ion implantation eliminates reproducibility and surface problem deficiencies of other introduction techniques. Implantation has been demonstrated to make possible a degree of control over the cell lithium content which has not previously been available. Front barrier development remains to be completed. Successful development of the barrier will make available the freedom to select optimum lithium concentration throughout the cell, including in the vicinity of the junction. Author

N72-10057*# Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
DEPENDENCE OF DEFECT INTRODUCTION ON TEMPERA-

TURE AND RESISTIVITY AND SOME LONG-TERM ANNEALING EFFECTS

G. J. Brucker *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 35-39 refs (See N72-10052 01-03)
Avail: NTIS CSCL 10B

The effort reported here represents data of lithium properties in bulk-silicon samples before and after irradiation for analytical information required to characterize the interactions of lithium with radiation-induced defects in silicon. A model of the damage and recovery mechanisms in irradiated-lithium-containing solar cells is developed based on making measurements of the Hall coefficient and resistivity of samples irradiated by 1-MeV electrons. Experiments on bulk samples included Hall coefficient and resistivity measurements taken as a function of: (1) bombardment temperature, (2) resistivity, (3) fluence, (4) oxygen concentration, and (5) annealing time at temperatures from 300 to 373 K. Author

N72-10058*# Radio Corp. of America, Princeton, N.J. Astro Electronics Div.

DENSITY AND FLUENCE DEPENDENCE OF LITHIUM CELL DAMAGE AND RECOVERY CHARACTERISTICS

T. J. Faith *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 41-51 refs (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Experimental results on lithium-containing solar cells point toward the lithium donor density gradient dN sub L/dw as being the crucial parameter in the prediction of cell behavior after irradiation by electrons. Recovery measurements on a large number of oxygen-rich and oxygen-lean lithium cells have confirmed that cell recovery speed is directly proportional to the value of the lithium gradient for electron fluences. Gradient measurements have also been correlated with lithium diffusion schedules. Results have shown that long diffusion times (25 h) with a paint-on source result in large cell-to-cell variations in gradient, probably due to a loss of the lithium source with time. Author

N72-10059*# TRW Systems Group, Redondo Beach, Calif.

DEGRADATION AND RECOVERY MECHANISMS IN LITHIUM-DOPED SOLAR CELLS

R. G. Downing and J. R. Carter, Jr. *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 53-64 Prepared for JPL (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Several groups of lithium-doped solar cells have been evaluated under 1-MeV electron irradiation. Many of these groups indicated superior electrical output after irradiation and recovery as compared to similarly irradiated n/p solar cells. The superior cells are those with lithium concentrations of 2 to 5 x 10 to the 14th power atoms per cu cm at the junction. An irradiation of lithium-doped cells with 28-MeV electrons indicated a tenfold advantage of lithium-doped cells over n/p cells. Studies of the changes in the lithium concentration during recovery have shown the amounts of lithium reacting is highly nonlinear in regard to the electron fluence and varies greatly with distance from the junction. The results indicate that precipitation of lithium on radiation defects may be the cause of recovery rather than ion pairing. Author

N72-10060*# Northrop Corporate Labs., Hawthorne, Calif.

RADIATION TOLERANCE OF ALUMINUM-DOPED SILICON

O. L. Curtis, Jr. and J. R. Srour *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 65-70 refs Sponsored in part by JPL and DASA (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Data are presented that indicate that heat-treated Czochralski-grown aluminum doped silicon that undergoes an appreciable resistivity increase during heating at approximately 450 C is significantly more resistant to both neutron and gamma irradiation than boron doped material (or aluminum doped material that either has not been heat treated or does not experience an appreciable resistivity change during such a treatment). Data interpretation is, however, quite difficult due to the occurrence of severe trapping effects in heat treated material. Author

N72-10061*# Gulf Radiation Technology, San Diego, Calif.

EXPERIMENTAL AND COMPUTER STUDIES OF THE RADIATION EFFECTS IN SILICON SOLAR CELLS

R. E. Leadon, J. A. Naber, and B. C. Passenheim *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 71-80 refs Prepared for JPL (See N72-10052 01-03)
Avail: NTIS CSCL 20B

A summary of selected experimental results obtained on lithium-diffused bulk silicon is presented. Particular emphasis is placed on the radiation-induced degradation and thermal annealing of minority carriers in bulk silicon because solar cell output is related to the minority carrier lifetime. The temperature dependence of the minority carrier lifetime indicates the density and energy levels of the recombination centers and provides clues to their identity. Electron spin resonance and infrared absorption techniques are used to investigate the introduction and anneal of three specific radiation induced defects, which are thought to contribute to the recombination process. Author

N72-10062*# Naval Research Lab., Washington, D.C.

HALL EFFECT STUDY OF ELECTRON IRRADIATED Si(Li)

J. Stannard *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 81-84 refs Prepared for JPL (See N72-10052 01-03)
(Contract JPL WO-8056)
Avail: NTIS CSCL 10B

Measurement of the Hall coefficient as a function of temperature between 15 and 300 K allows the separate determination of donor and acceptor concentrations in silicon samples which were irradiated at 240 K by 1-MeV electrons and then thermally annealed at 300 K. In both lithium- and phosphorus-doped silicon irradiation increased the acceptor concentration and decreased the donor concentration due to the formation of vacancy donor pairs. Annealing did not change either concentration in phosphorus-doped silicon and caused both concentrations to decrease in silicon doped with moderate amounts of lithium. In addition to this, in both lithium- and phosphorus-doped silicon the concentration and energy level of the A center were measured at each point in the sample's history. This experiment was limited to float-zoned silicon doped with less than 6 x 10 to the 14th power donors per cu cm. Author

N72-10063*# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Sciences.

THE OBSERVATION OF STRUCTURAL DEFECTS IN NEUTRON-IRRADIATED LITHIUM-DOPED SILICON SOLAR CELLS

G. A. Sargent *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 85-90 refs (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Electron microscopy has been used to observe the distribution and morphology of lattice defects introduced into lithium-doped silicon solar cells by neutron irradiation. Upon etching the surface of the solar cells after irradiation, crater-like defects are observed that are thought to be associated with the space charge region around vacancy clusters. Thermal annealing experiments showed that the crater defects were stable in the temperature range 300 to 1200 K in all of the lithium-doped samples. Some annealing of the crater defects was observed to occur in the undoped cells which were irradiated at the lowest doses. Author

N72-10064*# Naval Research Lab., Washington, D.C.
RADIATION DAMAGE AND ANNEALING OF LITHIUM-DOPED SILICON SOLAR CELLS
R. L. Statler *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 15 Sep. 1971 p 91-98 refs Prepared for JPL (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Evidence has been presented that a lithium-diffused crucible-grown silicon solar cell can be made with better efficiency than the flight-quality n p 10 ohms-cm solar cell. When this lithium cell is exposed to a continuous radiation evironment at 60 C (electron spectrum from gamma rays) it has a higher power output than the N/P cell after a fluence equivalent to 1 MeV. A comparison of annealing of proton- and electron-damage in this lithium cell reveals a decidedly faster rate of recovery and higher level of recoverable power from the proton effects. Therefore, the lithium cell shows a good potential for many space missions where the proton flux is a significant fraction of the radiation field to be encountered. Author

N72-10065*# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering.
RADIATION DAMAGE ANNEALING KINETICS
M. S. Dresselhaus *In* JPL Proc. of the Fourth Ann. Conf. on Effects of Lithium Doping on Silicon Solar Cells 11 Sep. 1971 p 101-113 refs (See N72-10052 01-03)
Avail: NTIS CSCL 10B

Various spectral response studies are reported that assess lithium doping effects on the recovery process of electron damaged silicon solar cells. Measurements of both the minority carrier lifetimes and the energy level spectrum of the defects are used to predict lifetime damage constants and carrier removal rates relevant to the operation of the solar lithium-doped cell and its annealing kinetics. G.G.

N72-10066*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYNCHRONOUS ORBIT BATTERY CYCLER Patent Application
David A. Baer, inventor (to NASA) Filed 3 May 1971 20 p (NASA-Case-GSC-11211-1; US-Patent-Appl-SN-139528) Avail: NTIS CSCL 10C

An apparatus is described for controlling the charge and discharge time intervals of a battery to simulate the time periods a solar array is illuminated and shaded while on a spacecraft in synchronous orbit. The apparatus employs a pair of counters for driving a device into two states for differing time intervals for successively numbered periods, as determined by the occurrence of successive pulses from a 24 hour clock. NASA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N72-10067*# Techtran Corp., Glen Burnie, Md.
THE TYPES OF ACID PHOSPHATASE OF RED CELLS. STUDY OF 134 FAMILIES [LES TYPES DE PHOSPHATASE ACIDE DES GLOBULES ROUGES ETUDE DE 134 FAMILLES]
Van Nguyen Cong and J. Moullec Nov. 1971 6 p refs Transl. into ENGLISH from Rev. Eur. Etud. Clin. Biol., France, v. 12, 1967 p 574-576
(Contract NASw-2037)
(NASA-TT-F-14015) Avail: NTIS CSCL 06P

A study of 134 unrelated French families, with 465 children, was used to test the inheritance of the acid phosphatase types as recognized by starch gel electrophoresis of human red cell hemolysates. No exception was found to the three alleles rule previously established. The gene frequencies in Paris were PA=0.3214, PB=0.6386, and PC=0.0400. An example of the rare homozygous type C was found in the offspring of an AC x BC family. It is almost the mirror image of the type B. Using concentrated red cell hemolysates provided the opportunity to observe two fast additional zones. The alpha-zone was present in all phenotypes A, AB, and AC. The bata-zone was present in all phenotypes B, AB, and BD. Author

N72-10068*# Techtran Corp., Glen Burnie, Md.
THE OXIDATION OF PYRUVIC ACID IN YEAST [L'OXYDATION DE L'ACIDE PYRUVIQUE CHEZ LA LEVURE]
A. Alvarez, E. Vanderwinkel, and Y. M. Wiame Washington NASA Nov. 1971 15 p refs Transl. into ENGLISH from Biochem. Biophys. Acta (Netherlands), v. 28, 1958 p 333-341
(Contract NASw-2037)
(NASA-TT-F-14003) Avail: NTIS CSCL 06M

The methodology and the products used to describe the possible presence of pyruvic acid oxidation in yeast are presented. The yeast proteinic fraction obtained by a 20% to 75% saturation with ammonia sulfate was used for tests of pyruvic oxidose activity while parallel tests were conducted with the proteinic extracts from a mutant. The effects of replacing the pyruvate by ethanol or acetaldehyde were also studied. Results indicate that the pyruvic oxidation system exists in the yeast and also in the mutants grown with impaired respiration, the normal yeast grown anaerobically, and the industrially produced yeast from aerobic cultures. Evidences of paths which by-pass the free acid steps were also found. Author

N72-10069*# Translation Consultants, Ltd., Arlington, Va.
METHODS OF EVALUATING PULSED VIBRATIONS (VIBRATION EVALUTION METHODS 3) [SHOGEKI SHINDO NO HYOKAHO (SHINDO NO HYOKAHO 3)]
T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 15 p refs Transl. into ENGLISH from J. Acoust. Soc. Japan (Japan) v. 27, no. 1, Jan. 1971 p 33-39
(Contract NASw-2038)
(NASA-TT-F-13987) Avail: NTIS CSCL 06P

A method for evaluating pulsed vibrations of the type encountered in pile driving and forging work is proposed. Pulsed sinusoidal vibrations, damped vibrations, built-up vibrations, and a combination of damped and built-up vibrations were treated separately. J.G.M.

N72-10070*# Translation Consultants, Ltd., Arlington, Va.
METHODS OF EVALUATING COMPOUND SINUSOIDAL AND RANDOM VIBRATIONS [FUKUGO SEIGEN SHINDO TO RANDOMU SHINDO NO HYOKAHO (SHINDO NO HYOKAHO 2)]
T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 24 p refs Transl. into ENGLISH from Nippon Onkyo Gakkaishi (Tokyo), v. 27, no. 1, Jan. 1971 p 21-32
(Contract NASw-2038)
(NASA-TT-F-13986) Avail: NTIS CSCL 06P

A method for evaluation compound sinusoidal vibrations with several frequency components and random vibrations of a continuous wide frequency band is proposed. To evaluate sinusoidal vibrations, the vibration acceleration levels of their frequency components were converted into vibration greatness (VG) values and summed up in a method similar to one devised for assessment of noise. For random vibrations, threshold and equal sensation curves were determined for the random vibration with 1 and 1/3 octave-band. The effect on the whole body was measure and VG values were computed. The VG values were then summed up in the same method as in the compound sinusoidal vibrations. J.G.M.

N72-10071*# Translation Consultants, Ltd., Arlington, Va.
METHODS OF EVALUATING SINUSOIDAL VIBRATIONS (VIBRATION EVALUATION METHODS 1) [SEIGEN

SHINDO NO HYOKAHO (SHINDO NO HYOKAHO 1)]
T. Miwa and Y. Yonekawa Washington NASA Nov. 1971 23 p refs Transl. into ENGLISH from Nippon Onkyo Gakkaishi (Tokyo), v. 27, no. 1, Jan. 1971 p 11-20
(Contract NASw-2038)
(NASA-TT-F-13985) Avail: NTIS CSCL 06P

Psychological experiments were carried out by using vibration tables of the electrodynamic type in vertical and horizontal directions, to establish a systematic method of evaluation. Threshold levels and equal sensation levels, were observed by the method of paired comparisons on the whole body in sitting, standing, and lying postures and on the hand. It was shown that there is no difference in the threshold curves (T curves) between sitting and standing postures, and that the T curve of the horizontal vibration is higher by 10 dB than that of the vertical vibration in the domain above 5 Hz. A characteristic feature of the T curve of the lying posture is its dip near 80 Hz for the vertical vibration due to skull resonance. No clear differences in the equal sensation curves between sitting and standing postures were observed. The sensation difference between vertical and horizontal vibrations was also observed. Author

N72-10072*# Scientific Translation Service, Santa Barbara, Calif.
FURTHER STUDIES ON THE RELATION BETWEEN MITOCHONDRIA AND GLYCOLYSIS [WEITERE UNTERSUCHUNGEN UEBER DIE BEZICHUNG ZWISCHEN MITOCHONDRIEN UND GLYKOLYSE]
E. J. Schneider, A. Graffi, H. Bielka, and L. Venker Washington NASA Nov. 1971 4 p refs Transl. into ENGLISH from Naturwissenschaften (W. Berlin), v. 44, 1957 p 446
(Contract NASw-2035)
(NASA-TT-F-14034) Avail: NTIS CSCL 06E

The relation between mitochondria and glycolysis is studied. It is found that mitochondria influences glycolysis even when glucose alone is used as the substrate, and not combined with HDP. Author

N72-10073*# Translation Consultants, Ltd., Arlington, Va.
CONDITION OF THE HUMAN CARDIOVASCULAR SYSTEM IN TRUE AND SIMULATED WEIGHTLESSNESS
V. A. Degtyarev and V. M. Khayutin Washington NASA Oct. 1971 20 p refs Transl. into ENGLISH of the conf. paper "Sostoyaniye Serdechno-Sosudistoy Sistemy Cheloveka Pri Deystvii Nevesomosti i Pri Yeyo Modelirdvanii" Moscow, Acad. of Sci., 1971 p 1-17 Presented at the 4th Intern. Symp. "Man in Space", Yerevan, USSR, Oct. 1971
(Contract NASw-2038)
(NASA-TT-F-14030) Avail: NTIS CSCL 06P

The experience of manned space flights proves that weightlessness also has an effect on the cardiovascular system. Experiments were conducted, measuring diastolic, mean, marginal, and terminal systolic pressure, velocity of pulse-wave spread frequency of heartbeat, length of phase of the cardiac cycle, pulse, and minute volume of blood. Author

N72-10074*# Scientific Translation Service, Santa Barbara, Calif.
THE VARIATIONS OF NEUROMUSCULAR EXCITABILITY IN THE COURSE OF ACUTE GLUCIDIC NUTRITIONAL IMBALANCE [LES VARIATIONS DE L'EXCITABILITE NEUROMUSCULAIRE AU COURS DU DESEOUILIBRE ALIMENTAIRE GLUCIDIQUE AIGU]
R. Lecoq, Paul Chauchard, and H. Mazoue Washington NASA Nov. 1971 5 p refs Transl. into ENGLISH from Compt. Rend. (Paris), v. 216, 1943 p 211-213
(Contract NASw-2035)
(NASA-TT-F-14035) Avail: NTIS CSCL 06P

Neuromuscular excitability during acute glucidic imbalance was measured on pigeons. A state of encephalic excitation and an augmentation of the muscular chronaxies were found result. Author

N72-10075*# Scripta Technica, Inc., Washington, D.C.
INTEGRATISM: A PATH FROM THE SIMPLE TO THE COMPLEX IN UNDERSTANDING LIFE PHENOMENA [INTEGRATIZM: PUT OT PROSTOGO K SLOZHNOMU V POZNANII YAVLENIY ZHIZNI]
V. A. Engelhardt NASA Oct. 1971 28 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 6, Nov. - Dec. 1970 p 799-822
(Contract NASw-2036)
(NASA-TT-F-13729) Avail: NTIS CSCL 06C

In modern theoretical biology, two opposing trends are apparent: organicism and reductionism. Efforts are being made to overcome their contradictions and to achieve a synthesis of their methods of approach in tackling fundamental problems. Recent advances in molecular biology justify the opinion that increased attention be paid to studies along a line defined as integratism. Integratism attempts to elucidate the principles and mechanisms involved in the transition from the primitive and elementary biological level to levels of increasing complexity and organization, reversing the principle of reductionism. The basis of the transition from component parts to a complex whole is the integration of lower level elements into the whole of the next higher organizational level. The aim of integratism is to understand the factors which constitute the difference between the whole and the sum of its parts in the hierarchy of biological organization. Author

N72-10076*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Dept.
PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, period ending 30 Sep. 1971
Sep. 1971 51 p refs Sponsored in part by AEC
(NASA-Order W-12853; Project 0064010)
(NASA-CR-122848; QPR-22) Avail: NTIS CSCL 06M

A quantitative means was developed to investigate the sensitivity of current spacecraft sterilization plans to variations in D-values. A quantitative expression was derived to represent the distribution of D-values among a population of naturally occurring organisms. An investigation was made of (1) the inactivation of both Bacillus subtilis var. niger spores and Cape Kennedy soil spores by gamma-radiation at room temperature in a nitrogen environment, and (2) the thermoradiation resistance of Cape Kennedy soil spores at elevated temperatures below 125 C. The relation between standard survival experiments with bacterial spores in soils and results obtained on spacecraft surfaces is discussed. Sporocidal properties of aqueous formaldehyde can be increased by elevating the temperature. Author

N72-10077*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEDICAL INFORMATION MANAGEMENT SYSTEM (MIMS): AN AUTOMATED HOSPITAL INFORMATION SYSTEM
Sidney Alterescu, Paul B. Simmons (United Computing Systems, Inc.), and Ronald A. Schwartz (Federal City Coll., Washington, D. C.) Sep. 1971 103 p
(NASA-TM-X-65747; X-751-71-438) Avail: NTIS CSCL 06E

An automated hospital information system that handles all data related to patient-care activities is described. The description is designed to serve as a manual for potential users, nontechnical medical personnel who may use the system. Examples of the system's operation, commentary on the examples, and a complete listing of the system program are included. Author

N72-10078# Pittsburgh Univ., Pa. Dept. of Chemistry.
BIOLOGICAL APPLICATIONS OF MOESSBAUER SPECTROSCOPY Progress Report, Feb. 1970 - May 1971
L. M. Epstein and Darel K. Straub May 1971 52 p refs
(Contracts AT(30-1)-3859; AT(30-1)-3514)
(NYO-3859-13) Avail: NTIS

Various unsuccessful attempts to synthesize iron dinitrogen complexes containing sulfur ligands are summarized. Measurements of tris(N,N-disubstituted dithiocarbamato)iron(+3) solution magnetic moments by NMR methods and Mossbauer spectra of aryl substituted derivatives and cyclic derivatives of iron tris dithiocarbamates are discussed. The characteristics of the products of gaseous boron trifluoride reactions with benzene solutions of ferric tris dithiocarbamates are outlined, based on data from elemental analyses; conductivity measurements; and visible, infrared, and Mossbauer spectra, as well as chemical methods. The development of methods for preparing bis (N,N-disubstituted dithiocarbamato)iron(+3) complexes with moderate ligands is also included. J.M.

N72-10079# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

PSYCHOLOGICAL PERCEPTION PRINCIPLES OF CHARACTER RECOGNITION [WAHRNEHMUNGSPSYCHOLOGISCHE GRUNDLAGEN DER SYMBOLERKENNUNG]

Hannelore Radl-Koethe Nov. 1969 44 p refs In GERMAN *Its* Anthropotech. Mitt. Nr. 4/69
Avail: NTIS

The principles of physico-optical stimuli, photometry and colorimetry are discussed. Using a functional description of the eye, the psycho-physical effects of luminosity and color perception are examined. The psychological regularities of visual perception are critically reviewed. Finally, two experiments with direction indicators and signals drowned in noise are reported. ESRO

N72-10080# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

HEMATOLOGICAL EFFECTS OF LONG-TERM CONTINUOUS ANIMAL EXPOSURE TO CARBON MONOXIDE

Edmond H. Vernot, William F. MacKenzie, James D. MacEwen, Paul N. Monteleone, Jr., Marilyn E. George, Paul M. Chikos, Kenneth C. Back, Anthony A. Thomas, and Charles C. Haun Dec. 1970 17 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper No. 1
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727504; AMRL-TR-70-102-Paper-1) Avail: NTIS CSCL 06/20

Long-term continuous exposures of dogs and monkeys to CO produce a series of measurable changes resulting from the development of normocytic, normochromic polycythemia. Author (GRA)

N72-10081# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

PATHOLOGY IN ANIMALS EXPOSED TO HIGH CONCENTRATIONS OF CARBON MONOXIDE FOR SIX MONTHS

William F. MacKenzie, Roman L. Patrick, Jr. (Lab. for Exptl. Biol.), and Paul N. Monteleone, Jr. (Johnstown Mem. Hosp.) Dec. 1970 8 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper No. 2
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727505; AMRL-TR-70-102-Paper-2) Avail: NTIS CSCL 06/20

Rats, mice, baboons, rhesus monkeys, and beagle dogs were exposed to 460 mgm/cu. M CO for 71 days followed by 575 mgm/cu. M CO for 97 days in a 68% O2, 32% N2, 5 psi environment. Anatomic changes found were confined to rodents and consisted of an increase in heart and spleen weights. This can be explained on the basis of increased RBC volume and blood viscosity. The possibility that the rats had begun to reach the maximum tolerable compensatory increase in RBC volume must be considered based on the death of two rats on the 166th day of exposure with lesions suggestive of circulatory complications. No anatomic changes were found in the other species. Based on the pathologic studies, it is indicated that CO has no direct effect on the body that produces a degenerative anatomic change. The animals at risk in this experiment were young healthy adults in the case of the rodents and dogs and healthy adolescent primates. They are not representative of human population at risk in a civilian community or, for that matter, in the Air Force as a whole. However, it does seem that the body's ability to adjust to high CO levels is much greater than had been previously suspected and is limited mainly by available circulatory reserve. Author (GRA)

N72-10082# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ACUTE TOXICITY OF OXYGEN DIFLUORIDE

Harvey V. Davis Dec. 1970 13 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper No. 21
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727525; AMRL-TR-70-102-Paper-21) Avail: NTIS CSCL 06/20

Because of the potential use of oxygen difluoride (OF2) being used as an oxidizing fuel in the missile industry, it became necessary to define and characterize the hazards associated with the handling of this compound. The assessment of OF2 toxicity in this study was made by exposing four species of animals (monkeys, dogs, rats and mice) to various concentrations of the gas for 15 and 60 minutes. The acute effects of OF2 inhalation were shown mainly to be respiratory in nature. Tachypnea was the most prominent toxic sign observed in rodents. Upper respiratory and gastrointestinal tract irritations were observed in dogs and monkeys. The mortality response demonstrated a significant difference in the susceptibility of the various species to the toxic effects of the gas. Rats and mice were found to be much more susceptible than monkeys or dogs. Author (GRA)

N72-10083# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

CHRONIC EXPOSURE TO LOW CONCENTRATIONS OF MONOMETHYLHYDRAZINE

Charles C. Haun Dec. 1970 14 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper No. 22
(Contract F33615-70-C-1046; AF PROJ. 6303)
(AD-727526; AMRL-TR-70-102-Paper-22) Avail: NTIS CSCL 06/20

The increased use of MMH as a rocket fuel suggested the need for reevaluation of the current threshold limit value of 0.2 ppm. Tests were undertaken to determine the biological response of 4 animal species to repeated daily exposures to 2 and 5 ppm MMH for a 6-month period. Exposures were conducted on a 6 hour/day, 5 day/week basis covering a 26-week period. Both experimental groups as well as the control set of animals consisted initially of 8 beagle dogs, 4 rhesus monkeys, 50 Wistar rats and 40 ICR mice. The Thomas Domes were operated at 725 mm Hg pressure (normal ambient pressure is 740 mm Hg) to avoid leakage of MMH, with nominal air flows of 40 cfm. Continuous monitoring of MMH concentrations was performed with an Auto Analyzer. Of the various parameters selected to measure the chronic toxicity of MMH, a significant number did show positive indications of toxic stress. Furthermore, in many cases, the effects were clearly dose related. GRA

N72-10084# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

HUMAN SLEEP PATTERNS AND PSYCHOMOTOR PERFORMANCE DURING EXPOSURE TO MODERATE CONCENTRATIONS OF CARBON MONOXIDE

Robert D. O'Donnell, Paul M. Chikos, and James Theodore Dec. 1970 18 p refs Presented at 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper No. 3
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727506; AMRL-TR-70-102-Paper-3) Avail: NTIS CSCL 06/20

When subjects are allowed to sleep for a normal period of time in the presence of CO at a level up to 150 ppm, there is no major disruption of either their sleep patterns or subsequent psychomotor performance involving time estimation, mental arithmetic, tracking, or vigilance under either moderate or high workloads. With respect to the performance measures, no patterns were isolated which would indicate that more detailed study under the same conditions would yield any significant effects of CO exposure. Some extremely tenuous indications of possible changes in the mobility of subjects during their early stages of sleep were uncovered, and these should be investigated further. Author (GRA)

N72-10085# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ACUTE TOXICITY OF CARBON MONOXIDE UNDER HYPERBARIC CONDITIONS

Charles S. Rose (National Naval Medical Center, Bethesda, Md.) Dec. 1970 10 p refs Presented at the 1st Annual Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp., Dayton, Ohio *Its* Paper No. 5
(AF PROJ. 6302)
(AD-727508; AMRL-TR-70-102-Paper-5) Avail: NTIS CSCL 06/20

The toxicity of carbon monoxide was evaluated under conditions of elevated pressure to determine if a pressurized environment would result in an altered response of an animal to the gas. The results indicate that the toxicity of carbon monoxide is not altered by increases in ambient pressure up to approximately 8 ATA provided the partial pressure of oxygen in the atmosphere remains constant. Carbon monoxide, however, is unique in its mode of action and no attempts were made to evaluate any subjective effects, chronic effects, behavioral effects or measurements of decrements in performance during the exposures. Therefore, one should not generalize from data on carbon monoxide as to the toxicity of other materials under hyperbaric conditions. GRA

N72-10086# Ohio State Univ., Columbus.

THE EFFECT OF EXPOSURE TO LOW CONCENTRATIONS OF CARBON MONOXIDE

John Schulte Dec. 1970 6 p Presented at 1st Ann. Conf. on Environ. Toxicology, Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp., Dayton, Ohio *Its* Paper No. 6
(Contract F33615-70-C-1046)
(AD-727509; AMRL-TR-70-102-Paper-6) Avail: NTIS CSCL 06/20

Preliminary results of a study on low concentrations of carbon monoxide on human behavior and performance are summarized. GRA

N72-10087# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

EXPERIMENTAL HUMAN EXPOSURE TO CARBON MONOXIDE < 1 TO 1000 PPM

Richard D. Stewart, Jack E. Peterson, Michael J. Hosko, Edward D. Baretta, Hugh C. Dodd, Paul E. Newton, Terrance N. Fisher, and Anthony A. Herrmann Dec. 1970 28 p refs Presented at the 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 4
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727507; AMRL-TR-70-102-Paper-4) Avail: NTIS CSCL 06/20

As man grapples with the problems of air pollution in an attempt to establish air quality standards, he finds he possesses limited information regarding the biological effects of short-term and continuous exposure to low concentrations of carbon monoxide (CO). Only a few investigations have been conducted in which sophisticated instrumentation was used to search for minute changes in human performance induced by exposure to low concentrations of CO. Lacking is the information as to whether these minor alterations in function which have been reported are of any practical significance to the health, performance, or judgment of man as he performs his daily tasks. In an attempt to gather additional human toxicological information about CO, a series of experimental exposures to known concentrations of the gas was conducted. These exposures were designed to simulate the type encountered for industry and in urban areas where CO is absorbed over a period of hours. GRA

N72-10088# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

BEHAVIORAL RESPONSES TO SMALL DOSES OF CARBON MONOXIDE

Rodney R. Beard and Netta Grandstaff Dec. 1970 14 p Presented at the 1st Ann. Conf. on Environ. Toxicol., Fairborn, Ohio, 9-11 Sep. 1970; sponsored by SysteMed Corp. *Its* Paper no. 7
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727510; AMRL-TR-70-102-Paper-7) Avail: NTIS CSCL 06/20

Previous reports by several authors have emphasized that learned behavior patterns are more vulnerable to disruption by drugs when there is an increase in the complexity of the discriminative stimuli that control a given response or sequence of responses. The effects of low concentrations of CO on a series of complex sequential problems were determined to establish baseline data for further research on relative cognitive tasks. The CO went on after 30 minutes, remained on for 90 minutes, and was off for the remainder of the session for all days of testing when CO was given. The subjects completed an average of about 12 single tests on any one day of testing (a session). Only the effect of 250 ppm of CO were tested. There were four sessions with CO, three without. The results of tests indicated that only with an exposure to 250 ppm is there a significant decrement in performance, and this only in one subject among four. GRA

N72-10089# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

THE EFFECTS OF CARBON MONOXIDE ON CORONARY HEMODYNAMICS AND LEFT VENTRICULAR FUNCTION IN THE CONSCIOUS DOG

Jim D. Adams (School of Aerospace Medicine, Brooks AFB, Tex.), Howard H. Erickson (School of Aerospace Medicine, Brooks AFB, Tex.), and Hubert L. Stone (School of Aerospace Medicine, Brooks AFB, Tex.) Dec. 1970 19 p Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 8
(Contract F33615-70-C-1046; AF PROJ. 6302)
(AD-727511; AMRL-TR-70-102-Paper-8) Avail: NTIS CSCL 06/20

Low levels of carboxyhemoglobin can cause significant changes in coronary blood flow. Hypoxia induced by the elevation of COHb appears to have a different effect on the cardiovascular system than hypoxia induced by lowering the inspired oxygen. If the inspired O2 is lowered, the arterial Po2 is decreased. Under this condition, an increase is observed in coronary flow, heart rate, coronary stroke volume, and left ventricular dP/dt. When the inspired oxygen is held constant and the COHb is elevated, there is no change in the arterial Po2. An increase is observed in coronary flow, heart rate and coronary stroke volume but no changes in left ventricular dP/dt occur. The difference between the two modes of hypoxia is in the contractile force of the myocardium. The mechanism involved in the changes observed does not seem to be related to arterial Po2, since the carotid and aortic chemoreceptors are not known to be stimulated by increased concentrations of COHb. However, the heart rate increased with both modes of hypoxia, suggesting that the mechanism may involve central nervous system structures. Author (GRA)

N72-10090# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ANALYSIS OF SPONTANEOUS ACTIVITY FILMS BY A FULLY AUTOMATED ANALYZER

Anthony A. Thomas and Barrett L. Myers (Technology, Inc., Dayton, Ohio) Dec. 1970 12 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 11

(Contract F33615-70-C-1046; AF Proj. 6302)
(AD-727514; AMRL-TR-70-102-Paper-11) Avail: NTIS CSCL 06/20

Space cabin toxicology experiments conducted by the Air Force Aerospace Medical Research Laboratories concluded that spontaneous activity of unrestricted dogs measured by time lapse photography would furnish good behavioral information when properly analyzed. Several hundred hours of photographic data were obtained and a large amount was analyzed using visual and rudimentary electronic techniques. Due to the time consuming task of analyzing the large amount of data, it was theorized that an electronic system could be developed which would automatically categorize and display the change in spontaneous activities and further refine the experimental and analysis techniques used to analyze the time lapse photographic data. Author (GRA)

N72-10091# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PERMEATION TUBES AS CALIBRATED SOURCES OF GAS
Bernard E. Saltzman (Cincinnati Univ., Ohio) Dec. 1970 15 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970 *Its* Paper No. 12
(Contract F33615-70-C-1046; Grants ES00159; AP-00812; AF Proj. 6302)
(AD-727516; AMRL-TR-70-102-Paper-12) Avail: NTIS CSCL 14/2

Known low concentrations of gases are needed for toxicological studies, for calibration of instruments and for validation of analytical methods. Permeation tubes were developed as convenient sources. Liquified gases such as sulfur dioxide, nitrogen dioxide, hydrocarbons and hydrogen sulfide are sealed in Teflon tubing and permeate through the walls for long periods at relatively constant rates of a few milligrams per day. The report discusses the use of these tubes in toxicology studies. Permeation tubes have been found to be simple, convenient and relatively constant sources for periods as long as a year. Although they have been applied mainly for calibration of instruments, by appropriate modifications they should be suitable for toxicological chamber work. Author (GRA)

N72-10092# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Toxicology
BASIS FOR ESTABLISHING GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTIONS
May 1971 16 p
(Contract CPA-70-57)
(PB-199904; APTD-0684) Avail: NTIS CSCL 06T

The basic rationale used in the preparation of a series of guides for short-term exposure to air pollutants are presented. The assumptions underlying guide preparations are given. The factors and considerations in guide preparation are outlined. The evaluation of the relationship between exposure to a pollution and its effect on the population are discussed. Also included is a discussion of the selection of short-term Public Limit and Public Emergency Limits. GRA

N72-10093# National Academy of Sciences-National Research Council, Washington, D.C. Committee on Toxicology.
GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTANTS. 1: GUIDE FOR OXIDES OF NITROGEN
1 Apr. 1971 33 p refs
(Contract CPA-70-57)
(PB-199903; APTD-0667) Avail: NTIS CSCL 13B

Guides for brief, intermittent exposure to nitrogen oxides are compiled and presented. The oxides of greatest concern are nitric oxide, nitrogen dioxide and nitrogen pentoxide. Toxicological data is presented on these. Factors and conditions that can, modify and significantly alter human response to nitrogen dioxide are discussed. The most important ones are; temperature, predisposing disease, heredity, age and interactions to other environmental pollutants. Values for short term exposure to NOx are tabulated. Experimental data on humans and laboratory animals exposed to NO2 are included in the appendices. GRA

N72-10094# Naval Ship Research and Development Center, Washington, D.C.
TESTING AND MODELING STANDING MAN'S RESPONSE TO IMPACT WITH APPLICATIONS TOWARD PREDICTING LEG FRACTURE TO SHIPBOARD PERSONNEL
Joseph Gesswein and Paul Corrao Jun. 1971 44 p refs
(AD-727133; NSRDC-3656) Avail: NTIS CSCL 06/19

As a preliminary step in providing more effective protection for shipboard personnel against shock-excited deck motions, tests were conducted wherein human subjects were dropped stiff legged onto a force gage. The experimental results showed a linear relationship between the logarithm of the peak forces and the kinetic energy at impact. A mathematical model was devised to reproduce this relationship and to reflect the general shape of human force-time response to impact. The model was then used to develop a family of curves which would provide designers with a means of predicting conditions under which shipboard personnel would sustain leg fractures as the result of shock-excited deck motions. Author (GRA)

N72-10095# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF INJECTED HISTAMINE ON INTRACRANIAL PRESSURE AND SYSTEMIC BLOOD PRESSURE Technical Report, Mar. - May 1970
John W. Watters, Hughes P. Rue, and Samuel J. McChesney Apr. 1971 17 p refs
(AF Proj. 7757)
(AD-726543; SAM-TR-71-9) Avail: NTIS CSCL 06/16

To measure intracranial and systemic arterial pressures, ten Macaca mulatta monkeys were surgically prepared with catheters in the subdural space and in the abdominal aorta (via the femoral artery). The monkeys were stabilized in a state of light surgical anesthesia, then administered 50 micrograms/kg. of histamine intravenously over a 30-second injection period. ICP and blood pressure were monitored for 30 minutes. ICP reached a maximum pressure of 165% of baseline value at 2 minutes post-injection and was down to 110% of baseline at the end of the 30-minute observation period. Blood pressure reached the nadir of 72% of baseline at 4 minutes postinjection, and at the end of 30 minutes the pressure had returned to 102% of baseline value. Author (GRA)

N72-10096# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
STERILITY OF WATER RECOVERED FROM HUMAN WASTE DURING EXTENDED MISSIONS IS ATTAINABLE WITHOUT POST-TREATMENT: AN ENGINEERING APPROACH
Courtney A. Metzger Apr. 1970 10 p refs
(AF Proj. 6373)
(AD-727040; AMRL-TR-70-19) Avail: NTIS CSCL 06/11

The paper summarizes the results of an engineering approach to the problem of producing bacteria-free (viable or nonviable) water from human waste in an earth environment and/or during an aerospace mission. Author (GRA)

N72-10097# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DYNAMIC CHARACTERISTICS OF HUMAN SIGHT
A. A. Averyanov and V. S. Babenko 16 Mar. 1971 17 p refs Transl. into ENGLISH from Tekhn. Kino Televideniya (USSR), v. 14, no. 5, 1970 p 60-63
(AD-727174; FTD-MT-24-343-70) Avail: NTIS CSCL 06/16

Discussed are the method and results of experimental investigations of human sight dynamic characteristics and requirements for television systems parameters designed for transmitting the images of moving objects. Author (GRA)

N72-10098# Army Medical Research Lab., Fort Knox, Ky.
THE SUSCEPTIBILITY OF THE CHINCHILLA EAR TO DAMAGE FROM IMPULSE NOISE Progress Report
George A. Luz and James D. Mosko 12 Mar. 1971 16 p refs
(DA Proj. 3A0-61102-B-71R)
(AD-726333; USAMRL-921) Avail: NTIS CSCL 06/19

Five monaural chinchillas were exposed to impulses of 168 dB spL, and the loss of sensitivity for the pure tones of .3, .75, 1.5, 4.0, 6.0, 7.9, 11.0, 14.5, and 16.5 kHz was determined through an avoidance conditioning technique. The recovery of sensitivity was studied over 64 days after exposure. The chinchillas proved to be much more susceptible to this noise than the rhesus monkey. Author (GRA)

N72-10099# California Univ., Santa Barbara.
THERMAL EQUILIBRIUM STUDIES ON MEN BREATHING HELIUM-OXYGEN MIXTURES Final Report, 1 Mar. 1965 - 30 Jun. 1968
Steven M. Horvath, Fred. W. Kasch, Ernest D. Michael, Seward E. Miller, and Ethan R. Nadel 14 Jul. 1971 11 p
(Contract NONR-4222(07))
(AD-726753) Avail: NTIS CSCL 06/19

Studies which were conducted on divers before and after their Sea Lab exposures indicated that as a consequence of this exposure, a reduction in their maximal work capacity occurred and that the cost of submaximal work was greater. The men showed some evidences of acclimatization to cold. Additional studies were made to determine the relative contributions of core and surface receptors to the maintenance of thermal balance. It was shown that the thermal regulatory system was directly responsive to the thermal input from skin and that this has direct application to the problems faced by divers working in cold water. Studies of subjects working in helium-oxygen atmospheres (1 AA) at different ambient temperatures indicated a marked subjective impression of greater cooling which was not borne out by objective data. Progress was made towards developing a system to measure body temperatures in working divers. Considerable difficulty was experienced with tape deck systems, attempting to obtain eight hours continuous data on a single small spool, because battery life and power were markedly influenced by low temperatures. A new approach of considerable promise is under development which would eliminate most of the problems present in the initial systems. Author (GRA)

N72-10100# School of Aerospace Medicine, Brooks AFB, Tex.
UNDESIRABLE EFFECTS IN WORKING WITH LASERS [O DEISTVII NEBLAGOPRIYATNYKH FACTOROV PRI RABOTE S OPTICHESKIMI KVANTOVYMI GENERATORAMI]
A. B. Butman, E. A. Ermolaev, V. P. Zhokhov, R. I. Kovach, and A. I. Semenov [1970] 10 p refs Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), no. 7, 1968 p 43-47
(AD-726558; SAM-TT-R-1088-0771) Avail: NTIS
CSCL 06/18

The laser radiation does not only cause local changes in the eyesight, skin and other organs, but may also lead to general changes in the organism. In the experiment, it was established that after the eyes of the animals were subjected to laser radiation of low intensity, certain changes in the cardiac system, metabolism, hypophysial system -- cortex of adrenal glands -- and others were observed. In a number of cases these changes were quite manifest and persistent in character. The work with lasers may cause various local and general changes in the organism. This fact indicates that when operating a laser preventive and protective measures from possible detrimental effects caused by this basically new type of radiation should be taken. In addition, special attention must be paid to the preventive protection of the eyes. Author (GRA)

N72-10101# Yonsei Univ., Seoul (South Korea). Dept. of Physiology.
METABOLIC ADAPTION TO COLD Final Report, Sep. 1968 - Sep. 1969
Bok Soon Kang San Francisco Army Res. and Develop. Group (Far East) Jun. 1971 24 p refs
(Grant DA-CRD-AFE-S92-544-67-G76; AF PROJ. 9777)
(AD-726467; J-292-3; ARDG(FE)-J-292-3; FR-3) Avail: NTIS CSCL 06/16

Experiments on thermoregulatory responses to cold immersion stimulus were carried out in September, 1968 (summer studies) and February, 1969 (winter studies). Eight each of ama and control subjects were selected at random from a same community in Yong-Do Island, Pusan. The rate of fall in muscle temperature of forearm during a 30 minutes immersion in 6 C water bath was significantly slower in the ama in winter and was about the same in the two groups in summer. However, the magnitude of change in the skin temperature and the heat fluxes observed during immersion period was not significantly different either between groups or between seasons. Both finger blood flow and skin temperature during one hour immersion in 6 C water bath decreased significantly in the ama as compared to the control. The magnitude of cold-induced vasodilatation during immersion period was significantly greater in the control in winter. The magnitude of reactive hyperemia after a 5 minutes arterial occlusion in both air and 15 C water bath was significantly lower in the ama than in the control. In control subjects, post-occluded blood flow to resting values in the air was faster in the ama than in the control but was the same in the two groups. The results suggest that vasoconstrictor tone increased in the ama in winter, indicating the development of vascular adaptation as a part of cold acclimatization. Author (GRA)

N72-10102# School of Aerospace Medicine, Brooks AFB, Tex.
UTILIZATION OF LASERS IN BIOLOGICAL STUDIES [OB ISPOLZOVANII LAZEROV V BIOLOGICHESKIKH ISSLEDOVANYAKH]
L. B. Rubin [1970] 19 p refs Transl. into ENGLISH from Usp. Sovrem.
(AD-726557; SAM-TT-R-1084-0771) Avail: NTIS
CSCL 06/18

The article discusses the questions associated with wide possibilities of laser utilization in experimental biology. The author also emphasizes the possibility of studies of all possible action mechanisms during the interaction of laser radiation with biological systems. Author (GRA)

N72-10103# Kansas State Univ., Manhattan. Inst. for Environmental Research.
PHYSIOLOGICAL EFFECTS OF LOCALIZED VENTILATION
N. Z. Azer, Preston E. McNall, Jr., and H. C. Leung Feb. 1971 46 p refs
(Contract F44620-68-C-0020; AF PROJ. 7921; Proj. Themis)
(AD-727072; AFOSR-71-1986TR) Avail: NTIS CSCL 06/19

Localized ventilation was applied frontally to the head and neck of seated, clothed subjects, engaged in central tracking and peripheral tasks, in a 95F and 50% RH environxent. Eight different ventilating jet properties were tested. Thermal and comfort sensations were recorded, and their associated physiological responses were measured, for each subject during each test. In the 95F and 50% RH environment, the average thermal vote of all subjects was between warm and hot, while the comfort vote was between uncomfortable and very uncomfortable. It was possible, by applying local ventilation, to improve both sensory votes towards thermal neutrality and comfortable sensations. The ventilating jet which resulted in the best improvements in sensory votes had a velocity 750 f.p.m. and a temperature 50F at its outlet. Localized ventilation had no significant effects on the heart rate and rectal temperature. Author (GRA)

N72-10104# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS ON HUMAN PERFORMANCE OF COMBINED ENVIRONMENTAL STRESSES
Walter F. Grether Sep. 1970 21 p refs
(AF PROJ. AF-7222)

(AD-727041; AMRL-TR-70-68) Avail: NTIS CSCL 06/19

Research studies of environmental effects normally expose subjects to only one stress at a time, while in operational flying there are usually several stresses acting simultaneously. The possibility exists that effects of such combined stresses may be greater than would be predicted from single stress studies. There have been relatively few laboratory studies of human performance in which the subjects have been exposed to such combined stresses. This paper presents a critical review of these past studies from the particular viewpoint of whether performance decrements from combined stresses are more severe than would be predicted from single stress studies. Although the number of past studies is not sufficient to present a consistent or conclusive picture, they do suggest that combinations of environmental stresses do not present a special hazard in flying that could not be anticipated from results of single stress studies. Author (GRA)

N72-10105# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

EXAMPLES FOR THE HANDLING OF PSYCHOPHYSIOLOGICAL DATA USING A HYBRID ANALOG COMPUTER [BEISPIELE FUER DIE AUSWERTUNG PSYCHOPHYSIOLOGISCHER MESSDATEN MIT DEM HYBRIDEN ANALOGRECHNER]

G. Radl Oct. 1970 17 p refs GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 2/70
Avail: NTIS

Analog-hybrid computing circuits are described for the preprocessing of the following measurement data: electrocardiogjaphic signals of heart action; electromyographic signals of eyelid movements; electromyographic signals of the steady tone of a muscle group; and thermoelectric signals of a respiratory rate measuring device. The circuits are realized on a hybrid analog computer and the electrophysiological data are stored on a multichannel analog tape. To control program operation the input, intermediary, and output values are recorded with a 6-channel analog recorder. The data acquisition system interrogates and digitalizes the results of the preprocessing, and generates punched tape. Interrogation interval is 30 sec. ESRO

N72-10106# Navy Experimental Diving Unit, Washington, D.C.

NOISE: A HAZARD TO DIVERS AND HYPERBARIC CHAMBER PERSONNEL Final Report

James K. Summitt and Stephen D. Reimers 15 May 1971 33 p refs
(AD-725144; NEDU-RR-5-71) Avail: NTIS CSCL 06/19

Quantitative information describing ambient noise in the diving environment is almost non-existent. Sensorineural hearing deficits that have been observed in some diving groups have been attributed to previous noise exposure in non-diving situations such as exposure to small arms fire, engine room noise or flight deck noise. This report describes a series of experiments conducted at the Navy Experimental Diving Unit to determine the sound level in a variety of helmet diving and hyperbaric chamber situations from the surface to a depth of 200 feet. The data is defined in terms of the hearing damage risk criteria currently in use by the Navy. Results indicate that operations involving both diving helmets and hyperbaric chambers frequently expose personnel to hazardous levels of noise depending on the length of time of the exposure. Three cases of temporary sensorineural hearing loss thought to be related to noise exposure during air helmet dives are also presented.
Author (GRA)

N72-10107# School of Aerospace Medicine, Brooks AFB, Tex.

STUDY OF THE PECULIARITIES OF THE THALAMUS AND CORTICAL RECRUITMENT REACTION [K VOPROSU OB OSOBENNOSTYAKH TALAMO-KORKOVOIREAKTSII VOVLECHENIYA]

V. V. Fanardzhyan 1971 22 p refs Transl. into ENGLISH from the Russian
(AD-725322; SAM-TT-R-1054-0571) Avail: NTIS CSCL 06/6

A review of the literature concerning the functional organization of the unspecific thalamo-cortical projection system is presented. Certain characteristic properties of the recruitment reaction are analyzed. Results of personal investigations concerning the mechanism of the electrotonic distribution of recruitment potentials are reported. It is demonstrated that the latter part is taken to be a true phenomenon of recruitment. Data, allowing the differentiation between these two effects are cited. According to the author one has no right to speak about recruit phenomena only on a basis of its monopolar study. The creation of a powerful electrical field, detectable at a considerable distance, through the stimulation of subcortical structures, is proposed as an explanation of the mechanism of the physical distribution of potentials of the recruit reaction. The generation, by these structures, of discharges of high voltage, enables their registration independent of their synaptic conduction.
Author (GRA)

N72-10108# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).

INTRODUCTION TO EXPERIMENTAL PSYCHOLOGY [EINFUEHRUNG IN DIE EXPERIMENTELLE PSYCHOLOGIE]

Gerald W. Radl Dec. 1969 71 p refs In GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 6/69
Avail: NTIS

Two lectures are presented as an introduction to psychology for engineers and technicians working in human engineering technology. The development of psychology from philosophically based concepts to an experimental science is treated. The possibilities and limitations of experimental work in psychology are demonstrated. Special experimental methods in different branches of psychology (perception, learning, diagnostics, and sociology) are discussed. Author (ESRO)

N72-10109*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 94)

Oct. 1971 136 p refs
(NASA-SP-7011(94)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N72-10110# Atomic Energy Establishment, Cairo (Egypt). Radiation Protection Dept.

CHARACTERISTICS OF THE COLLIMATOR CONSTRUCTED FOR THE INCHASS WHOLE BODY MONITOR

S. M. Morsy and A. A. Alloush 1969 22 p refs
(UARAEE-82) Avail: AEC Depository Libraries

The properties of a multi-slit collimator designed for the 8 x 4 in. crystal of the Inchass whole body monitor are given. The minimum detectable activity using the collimator is calculated at two different energies. Septa penetration was taken in consideration by assuming the activity to be represented by a line source in the mid line of the subject. Factors affecting the absolute activity determination are studied. Author (NSA)

N72-10111*# Bionetics Corp., Hampton, Va.
BIOWASTE RESISTOJET PROPELLANT SYSTEM, BIOLOGICAL AND FUNCTIONAL ANALYSIS, TASK 1 AND 2 Summary Final Report
Sep. 1971 95 p ref
(Contract NAS1-10431)
(NASA-CR-111977) Avail: NTIS CSCL 06K

The influence of chemical contaminants in potential biowaste sources upon the design and interface requirements of a biowaste resistojet propulsion system for a space station and/or base are evaluated. Chemical contaminants are defined as all compounds present in biowaste other than carbon dioxide, water, and methane. The latter are the nominal effluent candidates for the biowaste resistojet. Author

N72-10112# California Univ., Berkeley. Lawrence Radiation Lab.
TECHNIQUES FOR MAPPING THE SPATIAL DISTRIBUTION OF STOPPING PION(MINUS) MESONS IN TISSUE
J. Sperindle, L. E. Temple, V. Perez-Mendez, A. J. Miller, and A. Rindi 3 Mar. 1971 16 p refs
(Contract W-7405-eng-48)
(UCRL-20291; UC-48; TID-4500) Avail: NTIS

A number of processes leading to the emission of photons and neutrons in negative pion capture reactions are discussed for potential use in radiation therapy to determine the stopping negative pion region. It is concluded that the scheme of detecting collimated medium energy gamma rays is the most effective. Author (NSA)

N72-10113# Ohio State Univ., Columbus. Communication and Control Systems Lab.
STABILITY AND CONTROL OF LEGGED LOCOMOTION SYSTEMS Ph.D. Thesis
Ammembal Lakshmana Pai Jun. 1971 186 p refs
(Grants AF-AFOSR-1901-70; NSF GK-25292; Project AF-9769)
(AD-727806; AFOSR-71-2157TR) Avail: NTIS CSCL 06/2

The report is a Ph.D. dissertation devoted to a study of stability and control in legged locomotion systems. All of the results obtained apply to a twelfth-order nonlinear differential equation model for the dynamical behavior of an animal or legged vehicle in three-dimensional space, these differential equations are linearized, and necessary and sufficient conditions for stable postural control system operation are derived for bipeds and for quadrupeds. The applicability of the results obtained to the nonlinear model is verified by a vibrational mode study of the nonlinear system by means of a computer simulation. The vibrational mode analysis and synthesis techniques are then used to obtain stable feedback control laws for four different quadruped gaits and for one type of biped walk. The results presented should be useful in the design of autopilots for legged vehicles for improved offroad locomotion and in obtaining a deeper understanding of locomotion in animals and man. Author (GRA)

N72-10114# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPERATIONAL MECHANISM OF A PARALLEL TYPE RECOGNITION DEVICE
S. Vosilyus and R. Yasinevichus 10 Feb. 1971 13 p refs Transl. into ENGLISH from the book "Avtomatika i Vychislitelnaya Tekhnika" Vilnyus, Izd-vo Mintis, 1968 p 69-73
(FTD PROJ. 6050205)
(AD-727170; FTD-MT-24-318-70) Avail: NTIS CSCL 09/2

An image is described by the addition sum of plane distribution of standard and noise brightness. If the noise is not correlated to the object and has a zero average value, the aggregate of the signals forming the description vector of the given object is a system of random values in a normal distribution. The operational device determines values proportional to the affiliation of the given object to one of the classes. The rule of processing the description vector is based on a determination of the maximum of the correlation between the unknown image and standard. Furthermore, the resolving power of the operational device, which is shown to increase considerably in the processing of the centered components of the description vectors, is of considerable importance. A description is given of an operational device using standard automatic computer amplifier. Author (GRA)

N72-10115# Illinois Univ., Urbana. Biological Computer Lab.
ACCOMPLISHMENT SUMMARY, 1970 - 1971
15 Jul. 1971 247 p refs
(Grant AF-AFOSR-70-1865; AF Proj. 9768)
(AD-727795; BCL-71.2; AFOSR-TR-71-2150) Avail: NTIS CSCL 06/4

Contents: Cognitive memory; Computing in the semantic domain; Life as poly-contexturality; Conditions for composition; Algebraic models of computer programs; Linguistic networks and their investigation using an interactive computer system; A computational technique for uncertainty analysis; Sensory-motor interactions the 'Critter': a model; An end of search, a means of understanding; a preface to the anti-document; Speech research of the past as a guide for the future; A measure of uncertainty (entropy) of distribution functions; Statistical dynamics of complex systems; Computer-lexicon; Computers and graphics; Experiencing the fourth spatial dimension; Pulse techniques in speech processing; Digital signal processing; The impulse as a measure of loudspeaker nonlinearity. GRA

N72-10116# Qei, Inc., Burlington, Mass.
BIOLOGIC DATA ANALYSIS Final Report
1971 85 p
(Contract N00014-69-C-0390)
(AD-727098; NR-105-501) Avail: NTIS CSCL 06/13

The project involves acquisition and analysis of micro-spectrophotometric data in the presence of noise. Bacteria at cryogenic temperatures submitted to ultraviolet radiation emit both phosphorescent and fluorescent radiation. Certain characteristics of this radiation appear to be unique to a given species of bacteria and thus may be a basis for identification of bacteria. The object of this study is to obtain a working system for extracting parameters of micro-spectrophotometric data in the presence of noise. Two main areas are covered. They are data acquisition, equipment interface and noise reduction, and mathematical analysis. GRA

N72-10117# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
STUDIES OF INFLATING RESTRAINT SYSTEMS Final Report
D. Hurley Robbins, Verne L. Roberts, and A. W. Henke Mar. 1971 158 p refs
(Contract DOT-FH-11-6962)
(PB-201264; DOT-HS-800-497) Avail: NTIS CSCL 13F

A total of 126 impact sled tests using dummy test subjects were conducted to study the protective potential of right front passenger inflating restraint systems. The experimental program consisted of: (1) selection and fabrication of a restraint system configuration; and, (2) testing relative to parameters, such as crash velocity, use or non-use of lap belts, occupant size, impact direction, crash deceleration pulse, and occupant position. Test results were correlated with predictions of a purely mathematical model. The level of protection offered by the system is summarized as a series of proposed velocity threshold curves beyond which performance is expected to be marginal. Author (GRA)

N72-10118# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
PRELIMINARY VEHICLE TESTS: INFLATABLE OCCUPANT RESTRAINT SYSTEMS. VOLUME 1: EXECUTIVE

SUMMARY Final Report, 30 Jun. 1970 - 31 Mar. 1971
James F. Martin and David J. Romeo Mar. 1971 40 p refs
(Contract DOT-FH-11-7621)
(PB-200875; CAL-YB-2990-K-1; DOT-HS-800-477) Avail: NTIS CSCL 13F

A test program was conducted in which 12 fullscale automobiles were crashed under controlled conditions to provide detailed performance data on inflatable occupant restraint systems (IORS). Both domestic and imported vehicles were used covering the range of size from sub-compact to standard. Flat faced barrier, pole, and car-to-car crash modes were included. Various arrangements of anthropometric dummies ranging in size from a 3-year old child to a 95th percentile male were used in the vehicles. Both the vehicles and the simulated occupants were highly instrumented and extensive high-speed movies were taken. Crash test procedures were developed and an evaluation of currently available IORS was made. Author (GRA)

N72-10119# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
ANALYSIS OF DAISY TRACK HUMAN TOLERANCE TESTS Final Report
James H. McElhaney, Verne L. Roberts, and D. Hurley Robbins Feb. 1971 170 p refs
(Contract FH-11-6962)
(PB-201265; Bio-M-71-1; DOT-HS-800498) Avail: NTIS CSCL 06S

The results of an analysis of film and transducer records from a series of impact tests on human volunteers are reported. The purpose of the test program was to compare lap belt versus lap belt plus air cushion restraint systems. The analyses indicated that the lap belt plus a rapidly inflated air cushion performed significantly better than the lap belt alone by reducing head motion, linear head acceleration, shoulder motion, and resultant neck and head injury. Author (GRA)

N72-10120# Life Sciences, Inc., Fort Worth, Tex.
AN INVESTIGATION OF VISUAL, AURAL, MOTION AND CONTROL MOVEMENT CUES Technical Report, 27 Jun. 1969 - 27 Jun. 1970
W. G. Matheny, A. L. Lowes, G. Baker, and J. A. Bynun Apr. 1971 109 p refs
(Contract N61339-69-C-0304)
(AD-726430; NAVTRADEVCEN-69-C-0304-1) Avail: NTIS CSCL 05/10

The report is devoted to the determination of how multi-sensory cues can be simulated and effectively used in the training of pilots. An analytical basis and cue taxonomy is developed and cues are postulated on the basis of information gained from the outside visual world, from sounds generated by the aircraft, and from cues resulting from aircraft motion and control movements. Description and measurement of the physical characteristics of the postulated cues are emphasized. Hypotheses are developed based upon the effects of postulated cues as they both function independently and interact with cues in other modalities. Experimentation is recommended which will lead to verification or modification of cue postulations. Author (GRA)

N72-10121# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TWELVE-MONTH EXPERIMENT IN A GROUND COMPLEX OF LIFE SUPPORT SYSTEMS
19 Mar. 1971 10 p ref Transl. into ENGLISH from the publ. "Pamphlet for the 1970 Exhibition of Achievements of the National Economy" USSR, 1970 p 2-4
(FTD Proj. 60101)
(AD-727264; FTD-HT-23-90-71; UR/0000-70-000-000) Avail: NTIS CSCL 06/11

The pamphlet presents a brief description of the units used in a test of twelve months duration with three subjects working in a closed-cycle life support system. Recycling and regeneration were used to meet all water and oxygen requirements. Author (GRA)

N72-10122# Army Aeromedical Research Lab., Fort Rucker, Ala. Aviation Center Team Study Group.
ENVIRONMENTAL EFFECTS ON ATTACK HELICOPTER CREW TASK PERFORMANCE IN THE NATO THEATER
Stanley C. Knapp, ed. May 1971 43 p ref
(AD-726949; USAARL-71-21) Avail: NTIS CSCL 06/19

The unique tasks, requirements and demands upon attack helicopter crews, and the effects of the environment upon the performance of these tasks are analyzed. Night operations under low ceilings, reduced visibility, high or low speeds, nap-of-the-earth flight profiles and a threat of sophisticated antiaircraft weaponry is defined as the 'worst-credible-environment' for the NATO theater. In this environment, the attack helicopter and its crew will be expected to fly a large percentage of its missions and deliver its ordnance with a high degree of accuracy. Task performance is outlined in a detailed matrix. Collective tasks are grouped into functional task clusters. The effects of climatic conditions, the hostile threat, social and civil factors upon performance of these task clusters are discussed. The effects of the machine/mission created environment are presented and include hypoxia, toxic products, temperature extremes, visual and optical problems, acoustics, vibration, and human factors. Author (GRA)

N72-10123# Texas Technological Univ., Lubbock.
THE EFFECT OF DIFFERENTIAL PAYOFF MATRICES UPON VIGILANCE PERFORMANCE Ph.D. Thesis
Peggy Janice Blackwell Aug. 1970 149 p refs
(Contract DAAD05-69-C-0102; Grant MH-3786-03; Proj. Themis)
(AD-727984) Avail: NTIS CSCL 05/10

The purpose of the research was to induce motivation in signal detection by manipulation of costs and payoffs. Expressed in terms of Smith's theory (1966), a subject's willingness to observe and report signals was manipulated. Author (GRA)

N72-10124# Smithsonian Institution, Washington, D.C. Interdisciplinary Communications Program.
TECHNOLOGICAL AUGMENTATION OF HUMAN COGNITION: AN INTERDISCIPLINARY REVIEW
15 Jun. 1971 45 p
(Contract N00014-67-A-0399-0004; NR PROJ. 154-288)
(AD-726755) Avail: NTIS CSCL 05/9

Five interdisciplinary interaction-discussion conferences were held and two independent task forces were created to explore new teaching and training concepts and methodologies, particularly as new technologies provide potentially powerful, symbiotic means of augmenting human cognition. These conferences sought to determine two factors: research programs upon which to establish bases for innovation and improvement, and critical analyses of current and projected concepts and techniques. Author (GRA)

N72-10125# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.
EFFECTS OF REAL WORLD RADIO CHATTER ON MID-PHASE INSTRUMENT GROUND TRAINER PROFICIENCY: A PILOT STUDY
Ronald A. Goebel, Roger L. Williamson, and David R. Baum Nov. 1970 17 p refs
(Proj. AF-1123)
(AD-727054; AFHRL-TR-70-38; Task-112302) Avail: NTIS CSCL 05/9

Under a background condition of either recorded radio chatter or no radio chatter, the individual performances of two flights of mid-phase instrument student pilots were measured during a simulated instrument cross-country mission in the T-38 ground trainer. Operational constraints prevented the exercise of optimal experimental controls, thereby precluding definitive conclusions concerning the effects of radio chatter on performance. Nevertheless, the study established certain methodological guidelines for future research. Additionally, analysis of the comments of those students receiving radio chatter revealed that

the vast majority reacted favorably and enthusiastically to the chatter because it afforded the mission a high degree of realism.
Author (GRA)

N72-10126# American Inst. for Research, Pittsburgh, Pa.
THE DEVELOPMENT, TEST, AND EVALUATION OF THREE PILOT PERFORMANCE REFERENCE SCALES
Walter R. Horner, Thomas L. Radinsky, and Robert Fitzpatrick Brooks AFB, Texas Air Force Human Resources Lab. Aug. 1970 73 p refs
(Contract F33615-69-C-1366; AF PROJ. 1710)
(AD-727024; AFHRL-TR-70-22) Avail: NTIS CSCL 05/9

The report describes the results of a study to develop pilot performance reference scales based upon audio-video recordings of in-flight performances of students undergoing T-37 undergraduate pilot training. The study included scale development as well as the test and evaluation of each scale. All the maneuvers contained on the in-flight recordings were analyzed, and constituent performance elements observable on the video replay were identified. Three maneuvers, Final Turn to Landing, Vertical S 'A', and Lazy Eight, were selected for the final scaling effort. Ten performance elements each were identified for the Lazy Eight and Vertical S 'A' manuevers, and twelve elements for the Final Turn to Landing. A performance reference scale was developed for each maneuver. Each scale consisted of a series of subscales for rating performance on each of the elements of the maneuver and an additional subscale for rating the overall performance of the maneuver. Although some elements were common to more than one maneuver, the rating scales for these elements were tailored in each case to the maneuver involved. Each subscale consisted of a ten-point rating line (a row of ten boxes) representing the full range of performance from unsatisfactory to excellent and, beneath, four graded verbalizations describing different levels of performance. No verbalizations were presented, however, with the subscale used for rating overall performance. Final versions of the scales were subjected to a test and evaluation through their utilization by experienced instructor pilots. These pilots assigned levels of performance based upon what they observed on video replays of selected maneuver examples.
Author (GRA)

N72-10127# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CREW COMPARTMENT VIBRATION ENVIRONMENT IN THE B-52 AIRCRAFT DURING LOW-ALTITUDE, HIGH-SPEED FLIGHT Final Report, Aug. 1966 - Dec. 1970
Jerry D. Speakman and Justis F. Rose, Jr. Mar. 1971 206 p refs
(AF PROJ. 7231)
(AD-727023; AMRL-TR-71-12) Avail: NTIS CSCL 06/19

Measurements were made of the pilot station vibration environment experienced in the B-52 aircraft during low-altitude, high-speed flight. Data were obtained of the longitudinal, lateral and vertical linear accelerations and the roll axis angular velocities and accelerations. The terrain contour following flights at 500-900 feet above the flat to semi-mountainous regions of Louisiana and Arkansas were made at 350 knots true airspeed. Data analyses included probability density and distribution and the auto-power spectral density functions in addition to tests for stationarity, randomness and normality. The individual degree-of-freedom results are presented in graphical and tabular form and in general indicate that the pilot station vibration environment produced by the combination of gust response and maneuvering: (1) is stationary for up to 590 seconds; (2) is a random phenomena that does not satisfy the chi-square goodness-of-fit test for Gaussian distribution; (3) cannot be adequately simulated in the laboratory for human biomedical tolerance and/or psycho-physiological performance studies using only vertical axis motion; (4) is remarkably in agreement with those PSD's calculated for the lateral and vertical axes using an aircraft transfer function experimentally derived on another program and the Dryden gust input spectrum.
Author (GRA)

N72-10128# General Electric Co., Schenectady, N.Y. Specialty Materials Handling Products Operation.
RESEARCH AND DEVELOPMENT PROTOTYPE FOR MACHINE AUGMENTATION OF HUMAN STRENGTH AND ENDURANCE: HARDIMAN 1 PROJECT Summary Progress Report, Jan. 1970 - Apr. 1971
B. John Makinson 1 May 1971 33 p Sponsored in part by Army
(Contract N00014-66-C-0051; Proj. IM-62410105072)
(AD-724797; S-71-1056) Avail: NTIS CSCL 06/2

The implementation of the Hardiman powered exoskeleton concept was carried to the point where a prototype unit, consisting of 30 hydraulically powered, servo-controlled joints were fabricated and mechanically assembled. One of the arm assemblies was previously operated and has met basic design objectives under test. The Leg and Girdle System was also completed and has gone through partial testing of its twelve servo-controlled joints.
Author (GRA)

N72-10129# Royal Aircraft Establishment, Farnborough (England).
THE DEVELOPMENT OF ELECTRO-PNEUMATIC VALVES FOR ARTIFICIAL LIMBS
A. J. Barter Nov. 1970 51 p refs
(AD-726492; RAE-TR-70206; trc-br-22435; Space-347) Avail: NTIS CSCL 06/12

The development of electro-pneumatic flow control valves for artificial limbs is described. Initially a flexible membrane type of valve was chosen for evaluation. At the small sizes necessary for prosthetic systems, the major problem highlighted was gas leakage. It is concluded that the Flexible Membrane Valve did not realize its full potential in these small sizes. An alternative of using a Flat Faced Armature Valve and producing proportional control by variation of the mark to space ratio is described, in order to present as comprehensive a range of options as possible to the designer of artificial limb systems.
Author (GRA)

N72-10130*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
UNIVERSITY ROLE IN ASTRONAUT LIFE SUPPORT SYSTEMS: PORTABLE THERMAL CONTROL SYSTEMS
Arye R. Ephrath Washington NASA Nov. 1971 65 p refs
(Grant NGR-22-009-312)
(NASA-CR-1852) Avail: NTIS CSCL 06K

One of the most vital life support systems is that used to provide the astronaut with an adequate thermal environment. State-of-the-art techniques are reviewed for collecting and rejecting excess heat loads from the suited astronaut. Emphasis is placed on problem areas which exist and which may be suitable topics for university research. Areas covered include thermal control requirements and restrictions, methods of heat absorption and rejection or storage, and comparison between existing methods and possible future techniques.
Author

N72-10131# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
INVESTIGATIONS ON THE QUANTIFICATION OF MENTAL STRESS IN SIMULATED VEHICLE CONTROL TASKS [UNTERSUCHUNGEN ZUR QUANTIFIZIERUNG DER PSYCHISCHEN BEANSPRUCHUNG BEI SIMULIERTEN FAHRZEUGFUEHRUNGSAUFGABEN]
Gerald W. Radl Dec. 1969 30 p refs In GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 8/69
Avail: NTIS

In each of two experimental series ten individuals were involved in simulated flight control tasks of varying difficulties. Of each subject control performance data, such as heart rate, respiration rate, electromyogram data, and blinking rate were recorded. Ratings of the subjective mental stress were investigated. The value of blinking frequency and of electromyograms for measuring important components of mental stress were verified as well as the applied rating scales. Heart rate frequency, heart rate changing, and respiration data brought no significant results. The experiments led to the conclusion, that the recorded reaction times of parallel tasks yield useful information on mental stress. Author (ESRO)

N72-10132# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
POSSIBILITIES OF MOTIVATION MEASUREMENT IN ANTHROPOTECHNICAL TESTS [MOEGLICHKEITEN ZUR MESSUNG DER LEISTUNGSMOTIVATION BEI ANTHROPOTECHNISCHEN VERSUCHEN]
Brigitte Felden and Gerald W. Radl Jan. 1970 59 p refs In GERMAN; ENGLISH summary *Its* Anthropotech. Mitt. Nr. 1/70
Avail: NTIS

Motivation is treated as an important variable in psychological experiments, and its criteria of measuring techniques are defined. Different methods of testing are presented: self judgment by questionnaries, rating by specilly trained experts, use of verbal and graphical stimuli, and test like the Thematic Appreception Test. The test of Heckenhausen is pointed out in detail. All methods are discussed critically with respect to their experimental application under laboratory conditions. Since no method is applicable without restrictions, it is proposed to control motivation as an independent variable in engineering-psychological experiments. ESRO

N72-10133 National Lending Library for Science and Technology, Boston Spa (England).
METHODS OF MEASURING VISUAL FATIGUE [SPOSOBY IZMERENIYA ZRITELNOGO UTOMLENIYA]
M. A. Faermark 19 Aug. 1971 7 p refs Transl. into ENGLISH from Svetotekhnika (Moscow)
(NLL-Lib-Comm-1598-(5196)) Avail: Natl. Lending Library, Boston Spa, Engl: 1 NLL photocopy coupon

Methods are explored for measuring visual fatigue of workers engaged in tasks involving visual checks. The parameters of the object being observed, complexity of the visual task, and conditions of the operators vision are proposed as basics. The change in the individual functions of vision is established as a preferred method, to a first approximation, inasmuch as measurement of changes in productivity and quality of finished work is laborious and difficult to determine. E.M.C.

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N72-10134*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREPARATION OF POLYIMIDES FROM MIXTURES OF MONOMERIC DIAMINES AND ESTERS OF POLYCARBOXYLIC ACIDS Patent Applications
Tito T. Serafini, Peter Delvigs, and George R. Lightsey, inventors (to NASA) Filed 29 Sep. 1971 15 p
(NASA-Case-LEW-11325-1; US-Patent-Appl-SN-184960) Avail: NTIS CSCL 07D

Polyimides having high thermal and oxidative stability are prepared by the reaction, with application of heat, of a mixture of monomers. This mixture contains (a) a dialkyl or tetraalkyl ester of an aromatic tetracorboxylic acid, (b) an aromatic diamine, and (c) a monoalkyl or dialkyl ester of a dicarboxylic acid in which the ratio of a:b:c is n:(n+1):2 and n has a value of 1 to 20. The mixture of monomers is prepared in a 30 to 70% by weight solution of an organic solvent, a substrate impregnated with the solution, and heated at 50 to 205 C to remove the solvent and form a low molecular weight prepolymer. Then it is heated at 275 to 350 C to cure to a high molecular weight polyimide. NASA

N72-10135*# Midwest Research Inst., Kansas City, Mo.
FLUORINATED ESTERS OF POLYCARBOXYLIC ACIDS Patent Application
Laurence W. Breed and Richard L. Elliott, inventors(to NASA) Filed 23 Sep. 1971 10 p
(Contract NAS8-25510)
(NASA-Case-MFS-21040; US-Patent-Appl-SN-183240) Avail: NTIS CSCL 07D

The invention is directed to fluorinated esters of polycarboxylic acid (in particular, to esters of 3-methylglutaric acid) and to lubricating compositions based on these esters. They are useful for lubricating applications involving service under conditions at extreme temperatures. A preferred lubricating composition is obtained by incorporating 1/2 to 5 weight percent of an antiwear agent such as tricresyl phosphate in the liquid ester. Further addition of 15 to 20 weight percent of a thickening agent such as fluorocarbon telomer dispersion produces a grease. The chemical structure of the ester and the lubricating compositions obtained by combination of the esters with the additives are significant. Esters embodying the invention are characterized by a high degree of hydrolytic stability, wide range of liquidity, low evaporation rates, and minimum reactivity with liquid oxygen. NASA

N72-10136*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STABILIZATION OF PIGMENTS Patent Application
Stanley Roy Morrison and Thomas Freund, inventors (to NASA) Filed 20 Oct. 1970 13 p
(Contract NAS7-100)
(NASA-Case-NPO-11139; US-Patent-Appl-SN-82539) Avail: NTIS CSCL 11C

A method of coating pigment particles is described for preventing degradation and discoloration by ultraviolet light. The chemical species utilized serve as recombination sites for the electrons and holes produced by the radiation. The chemical species selected for a particular pigment should be one equivalent such that stable oxidation stages are formed differing by one electronic charge. Zinc oxide pigments coated with ferri- and ferrocyanide are discussed as an example. J.M.

N72-10137*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE REFLECTIVE COATING Patent Application
John W. Stuart, inventor (to NASA) Filed 12 Feb. 1971 18 p
(NASA-Case-GSC-11214-1; US-Patent-Appl-SN-115134) Avail: NTIS CSCL 11C

An improved non-specular diffuse reflective coating suitable for use in integrating spheres and the like is presented. Improvements include better chemical and optical stability, increased mechanical durability, longer useful service life, greater ease of formation of the coating, reduced thickness and material requirements, and ease of maintenance, repair, and cleaning. Excellent results were obtained when the salt was sodium chloride, the solvent diol with not more than one terminal hydroxy group, the non-solvent xylene or toulene, and the drying agent ethanol or isopropanol. NASA

N72-10138*# Tyco Labs., Inc., Waltham, Mass.
ELECTROCATALYST FOR OXYGEN REDUCTION Patent Application
Larry Leroy Swette, inventor (to NASA) Filed 3 Feb. 1971 12 p
(Contract NASw-1233)
(NASA-Case-HQN-10537-1; US-Patent-Appl-SN-112366) Avail: NTIS CSCL 07D

The performance and costs of an electrochemical catalyst as compared to a pure platinum catalyst is evaluated. The catalysts are used to reduce oxygen in low temperature alkaline fuel cells. The electrochemical catalyst is composed of silver and platinum and is dispersed in a resinous inert binder to provide a cell electrode. The results indicate the electrochemical catalyst is superior structurally to the platinum one for high current density operation, and is at least as active as the platinum catalyst in other operations. E.H.W.

N72-10139# Bhabha Atomic Research Centre, Bombay (India).
WATER CHEMISTRY STUDIES. 3: USE OF HYDRAZINE FOR SCAVENGING DISSOLVED OXYGEN IN HIGH TEMPERATURE WATER: A REVIEW
H. S. Mahal 1971 22 p refs
(BARC-530) Avail: AEC Depository Libraries

Properties of hydrazine for use as a deoxygenating agent for reactor coolant water are reviewed. Information is included on reactions of hydrazine with water, hydrogen formation, ammonia formation, effects of pressure and temperature, effects of catalysts, use of excess hydrazine, and reagents containing hydrazine groups. NSA

N72-10140# Iowa State Univ. of Science and Technology, Ames.
HYDROGENATION OF ETHYLENE ON IRIDIUM THIN FILMS Ph.D. Thesis, Feb. 1971
Paul Bruce Masterson Jun. 1971 159 p refs
(Contract W-7405-eng-82)
(IS-T-450) Avail: NTIS

The adsorption and reactions of C2H4, C2H6, and H2 dosed at pressures up to 50 microns on Ir thin films was investigated. The films, having geometric area of 300 sq cm and thickness of 30 to 200 A, were prepared under ultrahigh vacuum conditions by evaporation onto Pyrex at 100 C from a hot filament. Total pressure in the closed, one-liter reaction volume was monitored on a capacitance manometer and partial pressures were determined by continuous sampling of the reaction gases with a quadrupole mass spectrometer. Minimum resolution time was about one second. Hydrogen adsorption was found to obey an atomic Langmuir-type isotherm at a given temperature, but saturation coverage was found to increase with decreasing temperature. Hydrogen adsorption was proportional to film thickness (weight) with a maximum of 3.0 x 10 to the 14th power atoms adsorbed per microgram of Ir. Author

N72-10141# Iowa State Univ. of Science and Technology, Ames.
TORQUE-KNUDSEN MEASUREMENT OF THE VAPOR PRESSURE OF THE PLATINUM DIHALIDES M.S. Thesis
William George O'Brien Jun. 1971 76 p refs
(Contract W-7405-eng-82)
(IS-T-445) Avail: NTIS

The decomposition vapor pressures of the platinum dihalides (PtCL2, PtBr2 and PtI2) were determined directly by measurements of the torsional recoil of a suspended effusion cell (P) and indirectly by weight loss measurements through Knudsen effusion (pi). Knudsen effusion pressures are based on the molecular weight value of the diatomic halogen for the particular system studied. The actual molecular weight is higher due to the presence of platinum monohalide in the vapor phase. The effect of using this lower value of the molecular weight causes the Knudsen pressures to be somewhat higher than the torsional values especially at the higher temperatures. Values of enthalpy and entropy vaporization are given. Author

N72-10142# National Physical Lab., Teddington (England). Div. of Chemical Standards.
THE VISCOSITIES OF ORGANIC VAPOURS AT LOW PRESSURES
D. Reichenberg Aug. 1971 48 p refs
(NPL-DCS-11) Avail: NTIS

An analysis of the phenomenon, whereby entirely different sets of values of the Lennard-Jones potential parameters reproduced experimental vapor viscosity values equally well, has led to conclusions substantially identical with those of precedent data. Not only is the Lennard-Jones potential function degenerate (with respect to the evaluation of the potential parameters) over a considerable range of temperature but over a still wider range of temperature, it reproduces the effect of temperature on gas viscosity rather indifferently. A new one-parameter empirical equation has been developed to represent the viscosity temperature relationship. This equation well represents extant experimental vapor viscosity data. The single parameter in the viscosity equation may be calculated for organic compounds by the use of an additive relation and for this purpose a set of suitable constants based on the Lydersen scheme is given. Author (ESRO)

N72-10143# Georgia Inst. of Tech., Atlanta. School of Chemical Engineering.
SYNTHESIS, STABILITY, AND ENERGETICS OF HIGH ENERGY ROCKET PROPELLANT INGREDIENTS AT CRYOGENIC TEMPERATURES Final Scientific Report
Henry A. McGee, Jr. Jun. 1971 20 p refs
(Grant AF-AFOSR-1308-67; Project AF-9750)
(AD-727804; GIT-B-518-F; AFOSR-TR-71-2149) Avail: NTIS CSCL 21/9

Uniquely combined high energy excitation and cryogenic quenching arrangements were employed to synthesize unusual molecules of importance in chemical energy storage, high energy propulsion, and inorganic high temperature polymers. Cryogenic reaction and instrumentation facilities were designed and developed using principally mass spectrometric and infrared techniques. The molecular energetics of all interesting product species were developed from controlled energy electron bombardment techniques, and several recent LCAO-MO-SCF computational procedures were successfully modified and applied to the prediction and correlation of the energetics of both proposed and successfully synthesized product species. Attention was centered when postulated hydrides and fluorides of the light noble gases, the lower boron-hydrides, nitrogen-oxygen-fluorine compounds, and the boron-nitrogen isoelectronic analogs of acetylene, ethylene, and their halogenated derivatives. A listing with brief individual resumes of the 13 journal articles containing the detailed technical results of this project are presented in this final report. Author (GRA)

N72-10144# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
ANISOTROPIC ULTRASONIC WAVE PROPAGATION IN A NEMATIC LIQUID CRYSTAL PLACED IN A MAGNETIC FIELD
Ernest D. Lieberman, James D. Lee, and Francis C. Moon Oct. 1970 10 p refs
(Contract N00014-67-A-0151-0004; NR Proj. 064-410)
(AD-724708; AMS-976 TR-22) Avail: NTIS CSCL 07/4

Ultrasonic longitudinal waves were observed in a nematic liquid crystal (p-azoxyanisole) which was ordered by a magnetic field. Attenuation in the direction of the field induced nematic axis was 30% greater than that perpendicular to the axis, and was independent of field strength. No anisotropy in velocity was observed to an error of plus or minus 0.1%. Author (GRA)

N72-10145# Bureau of Mines, Bartlesville, Okla.
THERMODYNAMIC PROPERTIES OF ORGANIC DERIVATIVES OF THE LIGHTER ELEMENTS Final Annual Technical Summary Report, 1 Mar. 1970 - 1 Mar. 1971
Donald R. Douslin, Herman L. Finke, William D. Good, Roland H. Harrison, and John F. Messerly 1 Mar. 1971 25 p refs
(AF PROJ. 9750)
(AD-725757; AFOSR-71-1871TR) Avail: NTIS CSCL 07/4

Strained small ring systems were investigated as possible group constituents in synthetic high energy fuels. Thermodynamic properties of cyclopropylamine and oxetane were determined from a comprehensive investigation of the heat capacities and heats of transition in condensed phases, the enthalpies of formation, and vapor pressure relations. Gibbs energies and equilibrium constant of formation were calculated for the gas phase at 298.15K. A comparison of the effects on enthalpy of formation of alkyl-substituted, aliphatic ring systems was made for cyclopropanes, cyclopentanes, and cyclohexanes. The enthalpy of combustion and formation was reported for six alkyl-substituted cyclopropanes. Vapor pressures and the enthalpy of vaporization were determined for 1,2-diaminoethane. Author (GRA)

N72-10146# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE PROCESS OF ELECTROCHEMICAL REDUCTION OF SILVER CHLORIDE IN AQUEOUS SOLUTION. PART 1: INFLUENCE OF CURRENT INTENSITY AND ELECTROLYTE COMPOSITION ON THE FORM OF SILVER DEPOSITS
V. B. Aleskovskii, E. V. Bairachnyi, E. G. Ivanov, and V. A. Nikolskii [1971] 8 p refs Transl. into ENGLISH from Sb. Rab. Khimicheskim Istochnikam Toka (Leningrad), no. 4, 1969 p 241-251
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

An analysis is given of the structure of precipitates obtained in the cathodic reduction of silver chloride on fixed and rotating Ag/AgCl electrodes. It is established that the reaction proceeds through the stage of preliminary dissolution of the AgCl salt in aqueous solutions containing the chlorine ion. The cathodic behavior of a silver-chloride electrode in aqueous solutions was studied in order to utilize it in chemical current sources as well as to obtain highly-dispersed silver metal powders. Some hypotheses on the mechanism of the electrochemical reduction of silver chloride on an Ag/AgCl electrode were expressed to explain the experimental results obtained on the basis of polarization measurements and microscopic observations of the form and structure of the reduced silver precipitates. Author

N72-10147 National Lending Library for Science and Technology, Boston Spa (England).
STUDY OF PROCESSES AND CONDITIONS OF ELECTRODEPOSITION OF Ni-Ti ALLOYS OF DETERMINED COMPOSITION
G. Kadziene, J. Bubelis, and J. Matulis 2 Sep. 1971 6 p refs Transl. into ENGLISH from Liet. TSR Mokslu Akad. Darbai, Ser. B (Lithuania SSR), v. 61, no. 2, 1970 p 67-73 In RUSSIAN and ENGLISH
(NLL-TRANS-746-879-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The possibility of forming Ni-Ti alloys with a high Ti content from lactate-base electrolytes was investigated. The processes and conditions for electrodeposition of Ni-Ti alloys are outlined and discussed. Author

N72-10148 National Lending Library for Science and Technology, Boston Spa (England).
COMPLEX FORMERS AND OPTIMUM ELECTROLYTE COMPOSITION FOR OBTAINING Ni-Ti ALLOYS
J. Matulis, G. Kadziene, and J. Bubelis 2 Sep. 1971 7 p refs Transl. into ENGLISH from Liet TSR Mokslu Akad, Darbai, Ser. B (Lithuania SSR), v. 61, no. 2, 1970 p 57-65 In RUSSIAN and ENGLISH summary
(NLL-TRANS-746-880-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The possibility of electrodeposition of Ni-Ti alloys from electrolytes containing organic compounds as complex-forming additions was investigated. The equipment and methodology used in the study are described, and the results obtained are given. It is concluded that: (1) With the addition of lactic acid in the electrolyte containing Ti(SO4)2 = 0.0625, NiCl2 = 0.125, H3BO3 = 0.4 mole/l, pH = 2-6, and temperature = 18 C, qualitative Ni-Ti coatings, containing up to 0.15% Ti, can be obtained with efficiencies attaining more than 60%. (2)During electrodeposition of Ni from an electrolyte containing NiCl2 = 0.125, lactic acid = 0.5 mole/l, pH = 2-4, and temperature = 18 C, the efficiency value is considerably increased with the addition of 0.4 mole/l H3BO3. D.L.G.

N72-10149 National Lending Library for Science and Technology, Boston Spa (England).
PERIODIC PHENOMENA DURING ELECTRODEPOSITION OF NICKEL-PHOSPHORUS ALLOYS
R. S. Vakhidov, V. I. Popov, and A. A. Starchenko 2 Sep. 1971 4 p refs Transl. into ENGLISH from elektrokhimiya (USSR), v. 6, no. 11, 1970 p 1720-1722 In ENGLISH and RUSSIAN
(NLL-TRANS-746-881-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Electrolytic nickel-phosphorus alloys, obtained from the electrolyte (mol/1): NiSO4 - 0.64; NaCl - 0.34; H3BO3 - 0.32; NaH2PO2 - 0.24; H3PO4 - 0.51, at current density 0.1 amperes per square centimeter, temperature 70 C and time 30 min. on various metals, possess a layered structure. The mean thickness of the separate layers varies from 0.5 to 0.270 micron and, depends on the current density and the electrolyte temperature. The results of experimental investigations into the electrodeposition of a nickel-phosphorus alloy are reported. During the electrocrystallisation of certain metallic alloys, particularly in conditions of inclusion in the cathodic deposits of non-metallic components, the cathodic potential oscillates periodically. The periodic oscillation in potential of an electrode on which a nickel-phosphorus alloy is being deposited under galvanostatic conditions was determined. Author

N72-10150 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF ELECTROCHEMICAL BEHAVIOUR OF A NICKEL OXIDE ELECTRODE STUDIED BY THE FARADAY IMPEDANCE METHOD
V. P. Tysyachnyi and O. S. Ksenzhek 2 Sep. 1971 5 p refs Transl. into ENGLISH from Ukr. Khim. Zh. (USSR), v. 36, no. 5, 1970 p 456-459 In ENGLISH and RUSSIAN
(NLL-TRANS-746-785-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An experiment to evaluate the rate of the charging and discharging processes of a nickel oxide electrode according to the results of varying measurements was made. The measurements were conducted using a bridge of alternating current of the P568 type according to the standard scheme. The auxiliary electrode was platinum, coated with platinum black with a surface considerably larger than the surface of the investigated electrode. The amplitude of the changing potential, falling on the cell, did not exceed + or - 10 millivolts. The polarization curves of the discharging of thin nickel oxide electrodes are linear with the Tafel angle at approximately 10 mv. It is possible to assume that the rate of the proton volume is high, and the method of Faraday impedance, which possesses determined advantages during study of rapid reactions, can be helpful. Author

N72-10151 National Lending Library for Science and Technology, Boston Spa (England).
USE OF PHYSICAL METHODS IN AN INVESTIGATION OF CORROSION BEHAVIOUR OF Cr18Ni10Ti STEELS IN A BOILING AQUEOUS SOLUTION OF FORMIC AND ACETIC ACIDS
Yu. I. Perin et al 19 Aug. 1971 7 p refs Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (USSR), v. 6, no. 3, 1970 p 118-119
(NLL-CE-Trans-5697-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The corrosion resistance of Cr18Ni9 and Cr18Ni10Ti steels in a boiling aqueous solution of formic (2.6%) and acetic (3.15%) acids is discussed. The investigation showed that Cr18Ni9 and Cr18Ni10Ti chromium-nickel steels placed in a boiling aqueous solution of formic and acetic acid are subject to considerable general corrosion but there is no inter-crystalline corrosion. By combining gravimetric and physical methods of investigating corrosion, it is possible under laboratory conditions to demonstrate the character of corrosion disintegration of 18-9 steels in a specific aggressive medium and to assess their suitability for manufacturing chemical apparatus. Author

N72-10846*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LONG-TERM AGING OF ELASTOMERS: CHEMICAL

STRESS RELAXATION OF FLUOROSILICONE RUBBER AND OTHER STUDIES
S. H. Kalfayan, A. A. Mazzeo, and R. H. Silver *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 38-47 refs (See N72-10841 01-30)
Avail: NTIS CSCL 07D

N72-10903# Harvard Coll. Observatory, Cambridge, Mass.
TOWARDS AN ELEMENTARY THEORY OF THE PERIODIC TABLE
David Layzer *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 20-36 refs Sponsored by NSF (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N72-10152*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SINGLY CURVED REFLECTOR FOR USE IN HIGH GAIN ANTENNAS Patent Application
Arthur C. Ludwig, inventor (to NASA) Filed 5 Feb. 1971 18 p (Contract NAS7-100)
(NASA-Case-NPO-11361; US-Patent-Appl-SN-112988) Avail: NTIS CSCL 09D

A furlable antenna is described for use aboard spacecraft. The antenna is characterized by a reflector plate which conforms to a frusto-conical configuration combined with a point-source feed and a secondary reflector having a reflective surface which conforms to a figure of revolution generated by rotating a segment of a parabola about an axis parallel to the path of the intermediate rays. The antenna can be stowed in a furled configuration without substantially reducing its efficiency. NASA

N72-10153# Aeg-Telefunken, Backnang (West Germany). Fachbereich Weitverkehr und Kabeltechnik.
PROJECT COMMUNICATION-SATELLITE. PART 1: CONCEPT OF THE TRANSPONDER-CIRCUIT AND SYSTEM RESEARCH [PROJEKT NACHRICHTENSATELLIT. TEILBERICHT 1: SCHALTUNGSKONZEPT DES TRANSPONDERS UND SYSTEMUNTERSUCHUNGEN]
Lothar Friederichs, Dieter Ruetter, Werner Schreitmueller, Klaus Seidensticker, Franz Rudolf Theis et al Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jul. 1971 143 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-71-32-Pt-1) Avail: NTIS; ZLDI Munich: 30 DM

Alternative designs for a communication satellite transponder, compatible with the planned global system (Intelsat 3), are examined. An outline is given of the investigations which have led to the solution proposed having three through-connection possibilities and multiple access. The engineering model for the transmitter unit built according to this design is described, and test results are given. The transmitter's reliability is calculated as well as the bandwidth required for transmission, and the intermodulation distortion due to nonlinear amplification and AM/PM conversion is theoretically investigated. ESRO

N72-10154# Perkin-Elmer Corp., Norwalk, Conn. Optical Group.
THE DETECTION OF RECURRENCE PROCESSES Final Report, Jun. 1967 - Jul. 1971
Stanley J. Kishner Jul. 1971 108 p refs
(Contract N00014-67-C-0429; NR Proj. 187-403; Proj. RF101-03-07)
(AD-727626; PE-ER-10676) Avail: NTIS CSCL 09/4

It is shown in this report that if a known signal is repeatedly received at arrival times obeying a known statistical distribution, a likelihood ratio receiver can be realized in a sequential fashion which achieves improved detection performance over standard correlation techniques. The repeated occurrence of the signal waveform is described as a recurrence process. A number of investigators have considered the detection of recurrent waveforms, but only Nolte has formulated a receiver which considers the time structure of the recurrence. Nolte's assumption of white noise and simple Markov recurrence process structure are relaxed in the analysis presented in this report. In addition, the time structure of recurrence process is generalized beyond Nolte's description of synchronous and sporadic Poisson processes. Author (GRA)

N72-10155# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
EXPERIMENTAL DIAGRAM INVESTIGATIONS ON SIMULATED ANTENNA ARRAYS [EXPERIMENTELLE DIAGRAMMUNTERSUCHUNGEN AN SIMULIERTEN STRAHLERANORDNUNGEN]
K. Magura Dec. 1970 20 p refs In GERMAN Sponsored by Bundesmin. fuer Verteidigung
(Rept-13-70) Avail: NTIS

In order to determine radiation patterns in the Q-band, large antenna arrays were simulated by means of perforated metal plates forming the aperture of a dielectric lens antenna. The influence of excitation amplitude, phase errors, and hole position errors on the sidelobes are determined for calculated and measured radiation patterns and by error calculation. ESRO

N72-10156# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
SYSTEMS THEORETICAL DESCRIPTION OF THE TRANSMISSION CHANNEL IN TROPOSPHERIC SCATTER PROPAGATION [SYSTEMTHEORETISCHE BESCHREIBUNG DES UEBERTRAGUNGSKANALS BEI DER TROPOSPHAERISCHEN STREUAUSBREITUNG]
A. Wasiljeff Apr. 1971 44 p refs In GERMAN Sponsored by Bundesmin. der Verteidigung
(Rept-1-71) Avail: NTIS

The scattering of time-dependent electromagnetic waves at spatially disordered, statistically distributed, inhomogeneities of dielectric constant is investigated. The troposcatter link is characterized in terms of a statistically varying communication channel with a mean system function, called mean power impulse response. The distortion of complicated signal forms may be determined from measurements of this response. As an example, the intermodulation in a multichannel telephony system is calculated. ESRO

N72-10157# Royal Inst. of Tech., Stockholm (Sweden). Div. of Electron Physics.
THE TUNING OF A SIDE-COUPLED ELECTRON LINEAR ACCELERATOR STRUCTURE
H. Babic May 1971 41 p refs
(TRITA-EPP-71-07) Avail: NTIS

The procedure for tuning of a S-band linear accelerator structure of coupled resonators operating in the pi/2 mode is described. It is convenient to start the adjustment by measuring groups of three cavities (two accelerating and one coupling) followed by the adjustment of the whole structure. Author (ESRO)

N72-10158# National Academy of Engineering, Washington, D.C. Committee on Telecommunications.
COMMUNICATIONS TECHNOLOGY FOR URBAN IMPROVEMENT

Jun. 1971 234 p refs
(Contract HUD-H-1221)
(PB-200317) Avail: NTIS CSCL 13B

The proposal that modern communications technology can help in relieving many urban problems and in upgrading the level of city life is considered. It is suggested that efforts in telecommunications might well be followed by, and combined with, those of technologists in transportation, sanitation, energy, utilities, construction, and other fields, in the study of the city as a highly complex organization to which the principles of modern systems engineering can be applied. Author (GRA)

N72-10159# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

INVESTIGATIONS OF THE EQUIVALENT PARABOLA CONCEPT OF CASSEGRAIN SYSTEMS [UNTERSUCHUNGEN ZUM KONZEPT DES A EQUIBALENTEN PARABOLS BEI CASSEGRAIN-SYSTEMEN]

H. Gniss and G. Ries Dec. 1969 26 p refs In GERMAN
Sponsored by Bundesmin. der Verteidigung
(Rept-14-69) Avail: NTIS

The concept of replacing a two-reflector Cassegrain system by its equivalent parabolic reflector was investigated in order to determine the extent to which this concept is applicable to radial and axial feed defocussing of a Cassegrain microwave antenna. The phases in the antenna aperture for which power series are developed in view of the defocussing are discussed. Only for the first approximation, when the linear component is significant, are the same aperture phases observed for the Cassegrain system and its equivalent parabola. For greater defocussing, the quadratic component of the power series tends to result in larger divergences, from which the limits of validity can be determined for the equivalent parabola concept. An essential result is that one of the main advantages of Cassegrain systems is limited, namely small coma deviations due to long focal length of the equivalent parabola. ESRO

N72-10160# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

HYBRID PULSE COMPRESSION FILTERS WITH LARGE DYNAMIC RANGE Ph.D. Thesis - Aachen Univ. [HYBRIDE IMPULSKOMPRESSIONSFILTER MIT GROSSEM DYNAMIKBEREICH]

Hermann Schaefer Sep. 1970 170 p refs In GERMAN
Sponsored by Bundesmin. der Verteidigung
(Rept-5-70) Avail: NTIS

A hybrid filter is proposed for signal processing in a radar receiver. It is claimed that this system combines the advantages of the digital and the speed of the analog compressor, neither of which are in themselves optional. The desired pulse reponse of the filter corresponding to the time-inverted, conjugated complex signal function, is realized in the time domain with a tapped delay line. For delay, the sampled values of the filter input signal are digitalized, and reconverted to the analog situation for valuation by a resistance network. The filter can be used for any signal function, depending on the number of delay steps, and thus the time-bandwidth product. With parallel valuation networks, the filter is suitable for several Doppler channels. ESRO

N72-10161# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.

EFFICIENT DIGITAL ENCODING METHODS FOR IMPROVED MILITARY COMMUNICATION SYSTEMS Annual Scientific Progress Report, 2 Apr. 1970 - Apr. 1971

J. B. O'Neal, Jr. 1 Apr. 1971 103 p refs
(Contract F44620-69-C-0033; AF Proj. 7921; Proj. Themis)
(AD-725071; AFOSR-TR-71-1719; APR-3) Avail: NTIS CSCL 09/4

The report was written by the nine graduate students and six faculty members who compose the THEMIS research team working on Digital Encoding Systems at North Carolina State University. The research program is designed to accomplish two primary objectives: To obtain a basic understanding of the digital encoding process and to derive an optimum digital encoding algorithm under certain general conditions; and to determine explicitly what kinds of practical digital encoding equipment should be used for the various tasks which require it. In order to accomplish these objectives, three working groups were formed and progress is reported herein in each of these groups-source encoding theory, speech encoding and video encoding. The work of all these groups has been greatly enhanced by use of an Adage AGT-10 computer now jointly owned and controlled by the THEMIS project. This report is composed primarily of the individual progress reports of the team members and each of these individual reports is a self-contained subsection of the larger report. New results are reported in every area of the research program. Author (GRA)

N72-10162# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Div.

EXPERIMENTAL SYSTEM FOR DEEP-OCEAN ELECTROACOUSTIC IMMITTANCE MEASUREMENTS

L. P. Browder 18 May 1971 17 p
(NRL Proj. Rf 05-111-401-4471)
(AD-725107; NRL-MR-2247) Avail: NTIS CSCL 14/2

An experimental, remote-controlled, immittance-measuring bridge with telemetry equipment was used during sea trials to obtain electrical impedance and admittance measurements on electroacoustic transducers at depth in the ocean. This report describes the electronic instrumentation used and the results obtained from measurements made on six transducers. Recommendations are made for improving and modifying the system. Author (GRA)

N72-10163# Naval Electronics Lab. Center for Command Control and Communications, San Diego, Calif.

NUMERICAL RESULTS FROM VLF MODE CONVERSION IN THE EARTH-IONOSPHERE WAVEGUIDE Interim Report

Richard A. Pappert, Robert R. Smith, and Linda R. Shockey
12 Apr. 1971 41 p refs
(DASA-NWER-HB-042; NELC-M402)
(AD-725147; NELC-IR-712) Avail: NTIS CSCL 20/14

Numerical results are presented for several mode conversion models which allow for the inhomogeneity and anisotropy of the ionosphere. It is concluded that reflections associated with propagation across the terminator do not significantly affect mode conversion. It is shown that significant departure between mode conversion and WKB mode sums can occur when propagating across the terminator even for transition thicknesses as great as 1000 km. Numerical results are compared with the experimental modeling results of the American Nucleonics Corporation. Author (GRA)

N72-10164# Naval Postgraduate School, Monterey, Calif.

METHOD FOR ACCURATE RECEIVER TUNING AND PRECISE MEASUREMENT OF THE CARRIER FREQUENCY OF VOICE-MODULATED, SUPPRESSED-CARRIER, SINGLE-SIDEBAND RADIO SIGNALS

Lucius B. Day, Jr. and Glen A. Myers Apr. 1971 65 p refs
(AD-725139; NPS-52MV71041A) Avail: NTIS CSCL 17/2

A well known problem associated with suppressed-carrier single sideband (SSB) communications is the difficulty of accurately tuning a receiver to the suppressed-carrier frequency of the transmitter if this frequency is not known a priori at the receiver. Although it is possible to tune a receiver to within 20 to 30 Hz of the correct frequency by tuning for the most natural voice timbre (in the case of radio-telephone voice transmissions), this is an unacceptably subjective and inexact method for use in signal and frequency monitoring applications. This report describes an aural-visual method of tuning a SSB receiver to within about 3 Hz of the suppressed-carrier frequency of a SSB voice signal containing no discernable carrier. This tuning method supplements the familiar aural technique (tuning for most natural voice quality) with a visual oscilloscope display which facilitates an order of magnitude improvement in the accuracy of frequency measurement compared with aural tuning alone. A theoretical analysis is presented which shows that SSB speech signals contain information sufficient to determine the suppressed-carrier frequency. Also described are experiments which were conducted to indicate the effectiveness of this tuning method in determining the carrier frequency of SSB signals when the SSB message is human speech. Author (GRA)

N72-10165# Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE EFFECT OF THE PLASMA SHEATH SURROUNDING A FLIGHT VEHICLE ON THE EFFECTIVE RANGE OF RADAR
V. F. Mikhailov 5 Feb. 1971 10 p refs Transl. into ENGLISH from Radioelektronika (USSR), v. 12, no. 10, 1969 p 1238-1240
(FTD Proj. 0630)
(AD-724994; FTD-HT-23-15-71; UR/0000-69-012-01) Avail: NTIS CSCL 17/9

Expressions are derived describing the effects of a plasma sheath, caused by an ionizing shock wave at supersonic velocities, on the effective range of an onboard radar installation. The plasma sheath is analyzed as a lossy transmission line and as a receiver with a given noise temperature. Equations are obtained for the reduction in the SNR due to the noise emission of the plasma, the reduced power transmitted through the plasma, and the reduced effective antenna surface. A numerical example given for a flight vehicle moving 3.5 km/sec at an altitude of 60 km shows that the radar range can be reduced by a factor of 3.5. Author (GRA)

N72-10166*# Pennsylvania State Univ., University Park. Dept. of Astronomy.
A CATALOG OF DISTINCT SOLAR RADIO EVENTS FOR FIXED FREQUENCY OBSERVATIONS MADE AT THE PENNSYLVANIA STATE UNIVERSITY RADIO ASTRONOMY OBSERVATORY DURING THE PERIOD 1 JULY 1964 THROUGH 30 JUNE 1970. SECTION 1: DATA REDUCTION PROCEDURES
John P. Hagen and Frederick L. Wefer Aug. 1971 81 p refs
(Grant NGL-39-009-015; Contract Nonr-656(32); Grants NSF IOSY-2986; NSF GP-2986; NSF GA-720; NSF GA-1564; NSF GA-13714; NSF GA-28122)
(NASA-CR-123289; SR-023) Avail: NTIS CSCL 03B

A description of the equipment and a discussion of the radiometer system parameters are given. The measurement of solar radio flux densities is discussed in detail. The procedures used to correct the data for various effects, including an approximate correction for the atmospheric attenuation, are given. The factors effecting the accuracy of the flux density data are discussed and it is shown that the mean errors in the relative burst flux densities are about 8%, 7% and 8% for 10.7 GHz, 2.70 GHz and 960 MHz, respectively. A description is given of the data and the classification system used in preparing the catalog of distinct events. A complete tabulation of distinct solar radio events observed during the period 1 July 1964 through 30 June 1970 is given. The operating hours for each of the radiometer systems used in the study are tabulated for the period 1 July 1964 through 30 June 1970. Data interruptions of durations greater than 15 minutes are also given. Author

N72-10167# Naval Research Lab., Washington, D.C. Wave Propagation Branch.
RADAR SEA RETURN: JOSS 1 Final Report
J. C. Daley, J. T. Ransone, Jr., and J. A. Burkett 11 May 1971 54 p refs
(NRL Proj. WR 0-0167)
(AD-725110; NRL-7268) Avail: NTIS CSCL 17/9

The 4FR System was employed to obtain calibrated sea return data for various sea states as a function of radar wavelength, polarization, and depression angle. Surface truth was acquired simultaneously, utilizing laser altimetry, aerial photography, and observers stationed on Argus Island. Processing of the radar backscatter data is complete, and the median value of the normalized radar cross section (NRCS) sigma sub 0 of the sea has been determined as a function of radar and surface parameters. These data have been incorporated with the data resulting from previous measurement programs to form a comprehensive data bank of the parametric behavior of the median value of sigma sub 0, from which the following conclusions may be drawn: (1) The NRCS of the sea approaches a limiting value with increasing roughness for all frequencies and polarizations. (2) For depression angles 5 degrees to 60 degrees, the growth of the NRCS may be approximated by simple empirical formulas. (3) For the rougher conditions observed in the JOSS I mission, the NRCS data implied the presence of the equilibrium range spectrum. (4) The spectrum exhibited a characteristic dip at the higher wave numbers for calm sea conditions. (5) The cross-polarized return approaches a limiting value with increasing wind. Author (GRA)

N72-10168# Delaware Univ., Newark. Dept. of Electrical Engineering.
PHOTOELECTRON COUNTING IN OPTICAL COMMUNICATIONS Final Scientific Report, 1 Jan. 1970 - 31 Mar. 1971
L. Paul Bolgiano, Jr. and Bruce C. Lutz Apr. 1971 26 p refs
(Grant AF-AFOSR-2-67; AF-Proj. 9768)
(AD-725762; AFOSR-71-1206TR; Task-976802) Avail: NTIS CSCL 17/8

Scientific results are reported on a combined theoretical and experimental investigation of the processing of photoelectron counts as a means for observing low intensity optical communication signals. It is shown that the numbers of photoelectrons counted within successive equal time intervals, constitute a discrete-time signal which has the second moment correlation statistics of a signal with additive independent noise, and which can be processed by linear techniques. This count signal is shown also to have non-linear characteristics which can be represented statistically by higher order correlation functions. Author (GRA)

N72-10169# California Inst. of Tech., Pasadena.
RECENT RESEARCHES Final Report, 1 Oct. 1969 31 Mar. 1971
C. H. Papas May 1971 7 p
(Grant AF-AFOSR-1400-68; AF Proj. 9768)
(AD-725747; AFOSR-71-1806TR) Avail: NTIS CSCL 20/14

In this report the research that was performed during the past year and a half at the California Institute of Technology under Grant AFOSR-68-1400 is summarized briefly. The research was focused on electromagnetic theory and its application. Basic theoretical questions concerning the equation of motion of a charged particle in an electromagnetic field and concerning the influence of gravity on the polarization of an electromagnetic wave were settled. Also, electromagnetic problems rising from schemes for the early detection of clear air turbulence, for the shielding of moving vehicles and stationary objects against an electromagnetic pulse, and for the design of no-blackout spacecraft antennas were solved. Author (GRA)

N72-10170# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrophysics.
AN EXPERIMENTAL STUDY OF RADIO WAVE PROPAGATION IN DISSIPATIVE ENVIRONMENTS Final Report, 16 Jun. 1969 - 15 Jun. 1970
Theodor Tamir Fort Monmouth, N. J. ECOM Mar. 1971 22 p refs
(Contract DAAB07-68-C-0222; DA Proj. 1H6-64710-D-535)
(AD-725777; PIBEP-70-068; ECOM-0222-F) Avail: NTIS CSCL 20/14

The present report describes the design and the operation of an X-band measuring set-up that was assembled for the purpose of measuring certain basic propagation phenomena which occur in dissipative environments. The present set-up consists of a parallel-plate region which, by employing a Mylar metallized sheet as one of its two plates, represents an improvement that offers many advantages over less flexible instrumentation used in the past. Measurements were taken with the new set-up which verified the basic soundness of the improved instrumentation. In addition, these measurements reconfirmed the presence of a lateral wave at the interface to a Lossy dielectric, as already obtained in a preceding effort that was carried out at a different (K-band) frequency. Author (GRA)

N72-10171# Federal Aviation Administration, Washington, D.C.
AERONAUTICAL TELECOMMUNICATIONS IN SOUTHEAST ASIA: INDONESIA, LAOS, MALAYSIA AND THAILAND
1970 282 p
Avail: NTIS

Descriptions of existing airway operations systems, conclusions and recommendations, equipment requirements, proposed courses of action, and economic and financial factors in aeronautical telecommunications are presented and discussed for Indonesia, Laos, Malaysia, and Thailand. The background and regional aspects of the study including objectives, scope, and methodology are summarized. J.M.

N72-10172# Lockheed Missiles and Space Co., Palo Alto, Calif.
COHERENT PULSE SYSTEMS OF MOVING TARGET SELECTION
G. M. Vishin [1971] 20 p Transl. into ENGLISH from the book "Selektsiia Dvizhushchikhsia Tselei" Moscow, Voenizdat, 1966 p 40-70
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The spectral composition of reflected signals at the detector output of a coherent-pulse radar receiver is analyzed. Small bandwidth continuous wave-pulse systems are discussed as well as coherent-pulse systems with external and internal coherence. Modifications in the construction of coherent-pulse systems with a coherent heterodyne are examined. J.M.

N72-10173# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INVESTIGATION OF AIRBORNE MARKER BEACON Final Report, Jun. 1970 - Sep. 1971
Louis A. Dvorsky Nov. 1971 98 p
(Proj. 341-004-03X)
(FAA-NA-71-29) Avail: NTIS

Ground and air tests of a flight inspection marker beacon receiving system were made to identify and correct variations in marker pattern measurement from time to time and from aircraft to aircraft. The tests were made with both the T-29 Convair and DC-3 aircraft. Based on the flight test results, new receiver calibration and antenna system ramp calibration procedures were devised. Author

N72-10174 National Lending Library for Science and Technology, Boston Spa (England).
YTTRIUM IRON GARNET (YIG) APPLICATION IN MICROWAVE COMPONENTS, PART 1
H. J. Schmitt and G. Winkler 19 Aug. 1971 13 p refs Transl. into ENGLISH from Elektro Anzeiger, no. 5, Mar. 1970 p 73-78
(NLL-Trans-2785-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Procedures are described for the utilization of yttrium-iron garnet (YIG) in microwave components. The areas of application for YIG single crystals include: microwave filters, solid state delay lines, and modulators for infrared radiation. Applications of polycrystalline YIG emphasize its use as substrate materials in integrated microwave systems, and as the optimum ferrite material in digital phase shifters. D.L.G.

N72-10175 National Lending Library for Science and Technology, Boston Spa (England).
THIN FILM INTEGRATED CIRCUITS FOR TELECOMMUNICATIONS ENGINEERING
H. Kaufmann 19 Aug. 1971 17 p refs Transl. into ENGLISH from PTT Tech. Mitteilungen. (Switzerland), v. 48, no. 5, 1970 p 169-185
(NLL-Trans-2698-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The production of thin film circuits on a tantalum base is carried out by the following technological steps: (1) deposition of tantalum or of a tantalum nitride film by cathodic sputtering; (2) geometry definition by photolithography; (3) formation of the dielectric and adjustment of the resistors, by anodic oxidation;(4) deposition of the counter-electrodes and of the connecting circuits;(5) bonding of the active elements. The thin film diodes and transistors at present being made for CdS or Te are purely laboratory products, which do not yet lend themselves to mass production. As active elements certain semiconductor components, such as Ge and Si, can be obtained commercially in the most varied forms (encapsulated, in chips, in strips and beam lead). These elements are bonded onto the thin film circuits consisting of resistors and capacitors, in which such known methods of bonding as thermal compression and ultrasonic can be used. Author

N72-10850*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
MINICOMPUTER-CONTROLLED PROGRAMMED OSCILLATOR
R. Winkelstein *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 79-87 refs (See N72-10841 01-30)
Avail: NTIS CSCL 17B

N72-10851*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
A MULTIPLE-BEAM SPHERICAL REFLECTOR ANTENNA
R. Woo *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 88-96 refs (See N72-10841 01-30)
Avail: NTIS CSCL 17B

N72-10886*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENT T001: ENTRY COMMUNICATION ON THE GEMINI 3 MISSION
Lyle C. Schroeder, Theo E. Sims, and William F. Cuddihy *In its* The Gemini Porgram: Phys. Sci. Expt. Sum. Sep. 1971 p 471-485 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 17B

N72-10887*# Naval Research Lab., Washington, D.C.
EXPERIMENT D014: ULTRAHIGH AND VERY HIGH FREQUENCY POLARIZATION
Robert E. Ellis *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 487-507 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20N

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics

N72-10176# Joint Inst. for Nuclear Research, Dubna (USSR).
AUTOMATIC PROCESSING OF INFORMATION FROM SPARK CHAMBERS
N. G. Volchenkov, B. M. Golouin, and A. B. Preobrazhenskii 1971 15 p refs In RUSSIAN
(JINR-P10-5762) Avail: AEC Depository Libraries

Some mathematical problems of the automatic processing of experimental data from spark chambers are considered. The program system is based on the ideas of structural pattern

recognition. It assumes the construction of a semiotic system containing grammar for the language describing the considered class of experiments. The system of programs is written in the language REFAL and realized in computer BESM-6.
Author (NSA)

N72-10177# Australian National Univ., Canberra. Research School of Physical Sciences.
OPTICAL MODEL CODE JIB3 (VERSION PEREY 3)
D. J. Baugh and W. P. Bourke 1969 9 p refs
(ANU-P-451) Avail: AEC Depository Libraries

The optical model program JIB3 was written and adapted for use on the ANU IBM 360/50. Additional routines which enable grid searches, plotted output, and averaging over the experimental angular resolution are included. A solution to the Schroedinger equation for V(r) is obtained. NSA

N72-10178# New York Univ., N.Y. Dept. of Electrical Engineering.
A COMPUTER PROCEDURE FOR GENERATING VISIBLE-LINE DRAWINGS OF SOLIDS BOUNDED BY QUADRIC SURFACES
Peter Woon Dec. 1970 93 p refs
(Grant AF-AFOSR-1854-70; AF Proj. 9749)
(AD-724744; TR-403-15; AFOSR-TR-71-1613) Avail: NTIS CSCL 09/2

A computer procedure for generating line drawings of solid objects bounded by quadric surfaces is described. It embodies an efficient solution to the hidden-line problem, that is, the problem of determining which parts of an opaque object are invisible when the object is viewed from a given vantage point. A view of a quadric object is represented by the orthographic projection of surface boundaries visible from the given vantage point. The procedure is implemented in a FORTRAN program and can be extended to do perspective drawing and shading; it may be used as the basis of a system for interactive computer-aided design of solids on a CRT display console.
Author (GRA)

N72-10179*# Maryland Univ., College Park. Computer Science Center.
AN APPLICATION OF CLUSTER DETECTION TO SCENE ANALYSIS
Azriel H. Rosenfeld and Yung H. Lee Aug. 1971 45 p refs
(Grants NGR-21-002-008; NSF GJ-754)
(NASA-CR-123290; TR-167) Avail: NTIS CSCL 09B

Certain arrangements of local features in a scene tend to group together and to be seen as units. It is suggested that in some instances, this phenomenon might be interpretable as a process of cluster detection in a graph-structured space derived from the scene. This idea is illustrated using a class of scenes that contain only horizontal and vertical line segments. Author 5

N72-10180# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
SYNCHRONIZATION AND ERROR ANALYSIS IN RADAR DATA TRANSMISSION [SYNCHRONISIERUNG UND FEHLERERKENNUNG BEI DER RADAR-DATENUEBERTRAGUNG]
E. Hanle Bonn Bundeswehramt 1970 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-70-6) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

In studying the problems connected with multi-radar tracking, two radar systems with digital extractors and a data transmission unit to combine the data from both systems in one computer are needed. For optimum synchronisation, special information interlaced to the radar information is fed to the modems. These synchronisation blocks with the same length as target blocks have pseudo noise characteristics and are produced in a feedback shift register, which also serves for the time control of the whole data transmission process. Simple parity information added to every block in combination with the synchronisation blocks provides enough security against errors in transmission of radar information. Author (ESRO)

N72-10181# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
INFLUENCE AND RESTRICTIONS DUE TO SCALE INTEGRATION ON COMPUTER DESIGN AND BREAK DOWN OF FUNCTIONS Final Report **[INFLUENCE ET CONTRAINTES DU LSI SUR LA CONCEPTION ET LE DECOUPAGE DES CALCULATEURS COMP TE-RENDU FINAL]**
D. Herrerias Jul. 1970 134 p In FRENCH Sponsored by Delegation Gen. A la Rech. Sci. et Tech.
(DH/FO-1030/70-LCR/DR-5) Avail: NTIS

The object of this contract was to study the possibility of using large scale integrated circuits for designing logic circuits. Emphasis has been placed on structural changes of digital systems to take the best advantage of large scale integration characteristics. ESRO

N72-10182# National Physical Lab., Teddington (England). Div. of Computer Science.
A VERSATILE PROGRAM TEXT EDITOR FOR A SMALL COMPUTER
Donald A. Bell Jul. 1971 28 p
(NPL-COM-SCI-51) Avail: NTIS

The use of a text editor for program preparation is considered. The development of the text and its design are justified. A worked example is included, with a study on text storage algorithms. Emphasis is placed on user convenience and the integration of the editor with other standard software on the computer. Author (ESRO)

N72-10183# National Physical Lab., Teddington (England). Environmental Unit.
SOME EXPERIENCES WITH ON-LINE SPECTRAL ANALYSIS USING A SMALL DIGITAL COMPUTER
J. B. Roberts Mar. 1971 87 p refs
(NPL-Aero-1328) Avail: NTIS

The capabilities of an on-line spectral analysis system are described. Two approaches to the digital generation of spectral estimates, the correlation technique and the FFT technique, were adopted and a comprehensive appraisal of these methods is given. A full description of the physical and performance characteristics of the hardware involved is included.
Author (ESRO)

N72-10184# National Physical Lab., Teddington (England). Aerodynamics Div.
POSSIBLE DEVELOPMENTS OF A WIND TUNNEL COMPUTER SYSTEM
R. J. Young Sep. 1970 9 p
(NPL-AERO-1326; ARC-32396; Comp-FM-218) Avail: NTIS

Ways for developing the computer system with a view to providing multiple on-line facilities are explored. The function and applicability of available operating systems and hardware are discussed. The possibilities of a system using a sophisticated real-time executive program are compared with those of a system using a second computer. Author (ESRO)

N72-10185# Braddock, Dunn and McDonald, Inc., McLean, Va.
ELECTRA, ORESTES, AND SUPPORTING GRAPHIC DISPLAY CODES Technical Report, Jan. 1970 - Jan. 1971
David L. Jones and Deborah H. Stump Feb. 1971 275 p refs
(Contract DAAK02-70-C-0258)
(AD-724816; BDM/W-57-71-T-0258; DASA-NWER-EA-091; DASA-NWER-EA-094) Avail: NTIS CSCL 09/2

The programs documented in this report are part of a comprehensive package of digital computer codes which calculate the electromagnetic pulse (EMP) environment that is produced by a nuclear explosion. Each program is described in the form of a user's guide which includes a discussion on how the program operates, instructions on how to execute the program, and sample output generated by the program. Author (GRA)

N72-10186# Mitre Corp., Bedford, Mass.
THE APPLICATION OF MICROPROGRAMMING TECHNOLOGY
Judith A. Clapp May 1971 48 p refs
(Contract F19628-71-C-0002; AF Proj. 6710)
(AD-724718; MTR-2050; ESD-TR-71-105) Avail: NTIS CSCL 09/2

The report surveys promising applications of microprogramming. Emphasis is on the value of microprogramming as a tool which permits computer users to modify the architecture of a general-purpose machine to better match a particular set of requirements. Factors are discussed which affect the choice of microprogramming over hardware and software in the design and implementation of computer-based systems. Actual and potential examples of its application are given to illustrate its relevance to the solution of implementation and performance problems arising in typical Air Force systems. Finally, research and development tasks are proposed which lead to the realization of the benefits of this technology in operational command control and communications systems.. Methods are described for integrating the results into existing and future systems in the next several years. Author (GRA)

N72-10187# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEWLY DEVELOPED COMPUTERS AT THE CENTRAL RESEARCH INSTITUTE FOR PHYSICS
29 Dec. 1971 9 p Transl. into ENGLISH from Inform. Elektron. (Hungary), v. 4, no. 2, 1969 p 104-105
(FTD Proj. 6050205)
(AD-725075; FTD-HT-23-25-71; UR/0090-69-004-002) Avail: NTIS CSCL 09/2

The Central Research Institute for Physics at the Hungarian Academy of Sciences reports the development of two electronic computers. One, designated TPA, is a small universal computer designed for use as a satellite unit for computer systems, for performing data transmission, data collection, and data reduction tasks, for teaching purposes, and certain process-control tasks. The other computer, designated NTA 512 B, is a wired-program computer with a 1 K ferrite-core memory capacity, 16-bit work length and a cycle time of 16 mu sec. This unit is suitable for plotting amplitude and time histograms, for plotting latency histograms, for oscillographing single processes, for increasing the signal to noise ratio by averaging, and for measuring autocorrelation and cross correlation. Author (GRA)

N72-10188# Utah Univ., Salt Lake City.
GRAPHICAL MAN/MACHINE COMMUNICATIONS
Semiannual Technical Report, 1 Jul. - 31 Dec. 1970
David C. Evans RADC Griffiss AFB, N. Y. Mar. 1971 41 p refs
(Contract F30602-70-0300)
(AD-725102; RADC-TR-71-74) Avail: NTIS CSCL 09/2

The document includes a summary of research activities and facilities at the University of Utah. Report abstracts convey important research milestones attained during this period by each of the four major research activities: Computer graphics techniques; Computer systems; Digital waveform processing; Applications. Author (GRA)

N72-10189# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
HYBRID ANALOG COMPUTER GENERATED TELEVISION PICTURES AS AN EXAMPLE FOR ITS HIGH FREQUENCY APPLICATION [DIE ERZEUGUNG VON FERNSEHBILDERN MIT HILFEDES HYBRIDEN ANALOGRECHNERS ALS BEISPIEL FUER DESSEN HOCHFREQUENTEN EINSATZ]
J. Wernicke and P. Kuehne Oct. 1969 28 p refs In GERMAN *Its* Anthropotech. Mitt. Nr. 2/69
Avail: NTIS

Examples are given of television picture generation using high frequency hybrid analog computers. The simulation of electronic switching functions in a frequency range above that used for precision arithmetic is demonstrated. ESRO

N72-10190*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
USERS MANUAL FOR THE VARIABLE DIMENSION AUTOMATIC SYNTHESIS PROGRAM (VASP)
John S. White and Homer Q. Lee Washington Oct. 1971 167 p ref
(NASA-TM-X-2417; A-3882) Avail: NTIS CSCL 09B

A dictionary and some problems for the Variable Automatic Synthesis Program VASP are submitted. The dictionary contains a description of each subroutine and instructions on its use. The example problems give the user a better perspective on the use of VASP for solving problems in modern control theory. These example problems include dynamic response, optimal control gain, solution of the sampled data matrix Ricatti equation, matrix decomposition, and pseudo inverse of a matrix. Listings of all subroutines are also included. The VASP program has been adapted to run in the conversational mode on the Ames 360/67 computer. Author

N72-10191 Tennessee Univ., Knoxville.
A STUDY OF CONTROL SYSTEM SENSITIVITY
James Bradley Mankin, Jr. (Ph.D. Thesis) 1969 255 p
Avail: Univ. Microfilms Order No. 70-17836

A study is presented of sensitivity from a unified viewpoint which results in the development of a general formulation of the sensitivity problem. By focusing attention on its common characteristics, the sensitivity problem is organized within a common framework. Several examples are presented to illustrate the effectiveness of this formulation of sensitivity. Among the examples is the development of an algorithm which combines the computation of the state trajectory with the computation of the trajectory perturbation or the trajectory sensitivity functions. The control perturbation or control sensitivity function is included as an integral part of this algorithm. Efficient numerical methods and digital computer programs are developed to utilize these algorithms effectively. Bounds are developed for the round-off and truncation errors incurred in the computation of transition matrices. Using these bounds, an algorithm is developed for the efficient computation of transition matrices. The examples presented demonstrate that errors in the selection of computation parameters are reduced by this algorithm. Dissert. Abstr.

N72-10844*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Data Systems Div.
COMPUTER PROGRAM FOR THE AUTOMATED ATTENDANCE ACCOUNTING SYSTEM
P. Poulson and C. Rasmusson *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 27-32 (See N72-10841 01-30)
Avail: NTIS CSCL 09B

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N72-10192*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCESS FOR MAKING RF SHIELDED CABLE CON-

NECTOR ASSEMBLIES AND THE PRODUCTS FORMED THEREBY Patent Application
Aaron Fisher and Carroll H. Clatterbuck, inventors (to NASA) Filed 12 Feb. 1971 19 p
(NASA-Case-GSC-11215-1; US-Patent-Appl-SN-114873) Avail: NTIS CSCL 09A

The process basically comprises potting wires of a shielded cable between the cable shield and a connector housing to fill in, support, rigidize, and insulate the individual wires contained in the cable; coating the thusly formed potting with an electrically conductive material so as to form an entirely encompassing adhering conductive path between the cable shield and the metallic connector housing; and, forming a protective jacket over the conductive coating between the cable shield and the connector housing. NASA

N72-10193# Cambridge Electron Accelerator, Mass.
SIMPLE THRESHOLD AND DELAY CIRCUIT FOR MULTI-WIRE PROPORTIONAL CHAMBERS
Carlo Rubbia 5 Oct. 1970 10 p refs
(Contract AT(30-1)-2076)
(CEAL-1054) Avail: NTIS

A one-shot device with input threshold of about one millivolt was constructed and tested. The circuit, built around one quarter of an integrated circuit, delivers standard squared pulses of predetermined duration. By differentiation a delayed pulse can be generated. The circuit is sufficiently sensitive to be driven directly by the chamber in which traces of Freon 13 are added, thus eliminating the need for an amplifier. Author (NSA)

N72-10194# Mississippi Univ., University. Dept. of Electrical Engineering
EXPERIMENTAL INVESTIGATION OF THE TRIPOLE ANTENNA
Michael G. Harrison and Darko Kajfez Jun. 1971 80 p refs
(Grant NSF-GU-3833)
(PB-200516; NSG-GU-3833-2) Avail: NTIS CSCL 09A

An investigation is made of the impedance and radiation properties of the electric tripole antenna in order to determine its usefulness as a source of circularly polarized electromagnetic waves. The impedance is measured over the frequency range 900-2100 MHz both with and without a plane reflector placed behind the tripole. An analysis of possible sources of error in measurement procedure is made in an effort to find the cause of large variation in the measured data among the individual input terminals of the tripole. Author (GRA)

N72-10195# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HYBRID THIN FILM CIRCUITS
S. A. Maiorov 29 Jan. 1971 16 p Transl. into ENGLISH from Entsiklopediya Izmerenii, Kontrolya i Avtomatiz. (USSR), no. 9, 1968 p 21-24
(FTD Proj. 6050205)
(AD-724980; FTD-HC-23-670-70; UR/2950-68-000-009) Avail: NTIS CSCL 09/5

Based on published data, a general description of hybrid thin-film circuits is given. Circuits with discrete active elements: initial data required for designing such elements are listed. Construction of circuits with discrete active elements: typical structures with and without housing; methods of connections. Topology of the circuits with discrete active elements: sixteen rules for developing the topology are given. Methods of connecting microcircuits with hang-on components: pressure, ultrasonic, and laser welding methods are most widely used for connections. Monolithic thin-film circuits: mounting of active and passive elements on a Si-chip is explained; distinctive features of transistors and planar diodes; volume resistors, diffusion resistors, diffusion capacitors; insulation of chips. Hybrid structures: monolithic circuits combined with semiconductor components; several integrated circuits in one housing. Author (GRA)

N72-10196# Research Inst. of National Defence, Stockholm (Sweden).
ON THE PROBLEM OF ANTENNA POWER PATTERN SYNTHESIS FOR LINEAR ARRAY
Hans Steyskal May 1971 19 p
(PB-200868; FOA-3-B3026-61; ISBN-91-7056-001-3) Avail: NTIS CSCL 09E

Antenna power pattern synthesis is considered where a phase constraint on the field can be avoided, and a fit to a desired pattern obtained. It is shown that, mathematically, the problem consists in finding the optimum nonnegative harmonic approximation to a given function. Two different cases are considered: approximation in Gauss (weighted least-mean-square) sense, and approximation in Chebyshev's (equal ripple) sense. The former case reduces to a minimization problem, for which an exact solution is derived. For the latter case an approximate solution is offered. Examples of synthesized antenna patterns illustrating both methods are included. Author (GRA)

N72-10197# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFICIENCY OF MULTIPLEXING SYSTEMS AND COMMUNICATION CABLES IN THE TRANSPORT SECTOR
V. A. Rozanov, V. V. Gavrilyuk, and S. I. Khanin 22 Jan. 1971 12 p Transl. into ENGLISH from Avtomat Telemekhanika i Svyaz (USSR), v. 14, no. 6, 1970 p 12-14
(AD-725001; FTD-HT-23-70-71) Avail: NTIS CSCL 09/1

After a brief discussion of the status of long-haul cable communication circuits in the rail transport sector, a technical and economic analysis is presented of five possible approaches to this problem calling for a variety of cable and multiplexing equipment types. This comparative analysis shows that the most advantageous solution lies in the use of K-60 and K-300 multiplexing equipment for balanced circuits and small coaxial pairs, respectively. The need for combined long-line cable is underscored. Author (GRA)

N72-10198# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USE OF ELECTRON AND ION BEAMS IN MICROELECTRONICS
B. S. Danilin, Yu. V. Zaumysov, and G. A. Shteinman 1 Mar. 1971 22 p refs Transl. into ENGLISH from Mikroelektron. (USSR), no. 2, 1968 p 34-50
(FTD Proj. 6050205)
(AD-724965; FTD-HC-23-645-70) Avail: NTIS CSCL 09/5

A review is given of the state of the art in the use of electron and ion beam techniques in forming planar integrated circuits. The advantages of the beam techniques over generally used methods such as chemical or photo etching are discussed. Advantages include: reducing the minimum size of active and passive elements to the order of a micron or less, thus increasing the frequency range to 1-10 GHz and the given packing factor elements; elimination of masks, phototemplates, etc. in circuit manufacture; quicker forming of p-n junctions in semiconductors, with improved control of carrier density; and the general possibilities of contactless control of microcircuits. Diagrams of electron beam, ion beam, and combined electron-ion beam devices are given; an example is shown in a figure. Most of the techniques, and all other hardware cited, are from Western sources. Author (GRA)

N72-10199# Radio Corp. of America, Somerville, N.J. Solid State Div.
UHF MOS INTEGRATED CIRCUITS Quarterly Report, 1 Oct. - 31 Dec. 1970
Robert H. Dawson Jun. 1971 16 p
(Contract DAAB07-68-C-0252; DA Proj. 1-H-662705-A-440)
(AD-724722; ECOM-0252-11; QR-11) Avail: NTIS CSCL 09/5

Two ceramic carriers were designed and batch fabricated to accommodate beam-leaded UHF MOS transistors. One approach requires a receptacle hole to be formed in the ceramic piece.

This approach is attractive because it is ideally adaptable for use in UHF integrated circuits. The other approach is a thick-plate, planar approach that is amenable to large batch fabrication techniques. It too is adaptable for use in UHF integrated circuits but electrical grounding requires detailed consideration. Initial results with the planar approach are very encouraging.
Author (GRA)

N72-10200# Air Force Systems Command, Wright-Patterson AFB, Ohio.
LONG-LINE COMMUNICATION CABLES
E. G. Stavrov 22 Jan. 1971 15 p Transl. into ENGLISH from Avtomat. Telemekh. (USSR), no. 3, 1970 p 42-45
(AD-725000; FTD-HT-23-69-71) Avail: NTIS CSCL 09/1

Consideration is given to the most essential technical specifications of a large number of Soviet long-haul high- and low-frequency communication cables. Cable cross-sectional diagrams showing disposition, numbering, and color coding of the quads are also presented.
Author (GRA)

N72-10201# Auburn Univ., Ala. Radar Technology Lab.
C-BAND REACTIVE POWER DIVIDER DESIGN Final Report
E. R. Graf 29 May 1971 38 p refs
(Contract DAAH01-70-C-1000)
(AD-724707) Avail: NTIS CSCL 09/5

A design for a sixty-four way planar power divider in stripline is developed. The power divider is designed to meet specific requirements: frequency range of 5.25 to 5.75 GHz, VSWR less than 1.3:1, output amplitude difference between channels of plus or minus 0.5 dB, output phase difference of plus or minus 6 degrees, isolation between sum and difference ports of 40 dB minimum with the outputs terminated in matched loads and 35 dB minimum with the outputs terminated in shorts, power handling capabilities of 50w average and 5 Kw peaks, and output impedances of 50 ohms at each termination.
Author (GRA)

N72-10202# Texas Instruments, Inc., Dallas. Corporate Research and Engineering.
SURFACE WAVE DEVICES Final Technical Report, 15 Jan. 1969 - 15 Jan. 1971
W. S. Jones, C. S. Hartmann, and L. T. Claiborne Apr. 1971 146 p refs
(Contract N0014-69-C-0173; NR Proj. 017-503/10-23-69(421))
(AD-724769; TI-08-71-29) Avail: NTIS CSCL 09/1

This is the final report for a two year investigation of surface wave phenomena and devices. The investigation included both theoretical and experimental research on surface wave effects in piezoelectric and nonpiezoelectric substrates. Design procedures for interdigital transducers have been developed which are suitable for practical device realization. General relationships were derived from first principles; a new impulse response model was developed for first order transducer design; and second order effects were included. Experimental confirmation of theoretical results is shown for correlation and bandpass filters. The detection of surface waves via the piezoresistance effect in inversion layers is discussed in terms of a normalized gauge function. The magnitude of the gauge function in n- and p-type silicon inversion layers is given. Other special topics covered in the investigation include temperature effects in surface wave correlators, high frequency and wide bandwidth pulse compression filters, and effects of photomask inaccuracy on device performance.
Author (GRA)

N72-10203# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
A CHARACTER GENERATOR FOR ANTHROPOTECHNICAL INVESTIGATIONS [EIN SYMBOLGENERATOR FUER ANTHROPOTECHNISCHE UNTERSUCHUNGEN]
K.-F. Kraiss, K. R. Kimmel, and K. Steinheuer Oct. 1970 45 p ref In GERMAN; ENGLISH summary *Its* Anthroptech. Mitt. Nr. 3/70
Avail: NTIS

A free-programmable character-generator is described for the presentation of complex electronic displays. The stroke writing is performed by a combined integration and Lioujous procedure, that results in increased display quality. Programming of the displayed picture is done by simple statements on punched tape. By its uncomplicated handling, connected with high flexibility and display quality, the generator becomes an excellent experimental tool for the human engineering evaluation of electronic displays.
ESRO

N72-10853*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
HIGH-POWER MICROSTRIP RF SWITCH
S. D. Choi *In its* JAPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 110-124 refs (See N72-10841 01-30)
Avail: NTIS CSCL 09D

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N72-10204*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPILATION OF RESULTS PERTAINING TO THE BEHAVIOR OF PHASE LOCKED LOOPS
Norman Gleicher Aug. 1971 38 p refs
(NASA-TM-X-65735; X-752-71-351) Avail: NTIS CSCL 09C

State-of-the art on phase locked loops PLL is reported by summarizing some specific results. Following a statement of the overall analysis and design objectives, results are presented in a format identifying working terminology, inherent assumptions, and references for each result. The use of PLL in tracking, synchronization, and demodulation is reemphasized, as well as the mathematical challenge involved in solving nonlinear stochastic differential equations.
E.M.C.

N72-10205*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIGNAL CONDITIONING CIRCUIT APPARATUS Patent Application
Vard B. Holland, inventor (to NASA) Filed 5 May 1971 8 p
(NASA-Case-ARC-10348-1; US-Patent-Appl-SN-140439) Avail: NTIS CSCL 09C

A description is presented of a signal-conditioning circuit with an operational amplifier, a variable source of offset potential, and four resistive impedances. These are operatively associated in such a manner that the circuit has constant input impedance independent of gain and offset adjustments. Gain change is effected by varying one of the impedances in an amplifier feedback circuit, and offset adjustment is effected through variation of the offset potential source.
NASA

N72-10206# Joint Publications Research Service, Washington, D.C.
CYBERNETICS AND REGULATION THEORY
3 Sep. 1971 20 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 198, no. 5, 1971 20 p
(JPRS-53994) Avail: NTIS

CONTENTS:

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3. **PROBLEMS OF LINEAR DYNAMIC PROGRAMMING**
Yu. P. Ivanilov and A. I. Propoy p 13-18 refs (See N72-10209 01-19)

N72-10207# Joint Publications Research Service, Washington, D.C.
SOME PROBLEMS OF ADAPTIVE CONTROL
G. D. Penev and V. A. Yakubovich *In* Its Cybernetics and Regulation Theory 3 Sep. 1971 p 1-6 refs (See N72-10206 01-10)
(UDC-62-50) Avail: NTIS

The equations of motion used in the modeling of discrete control systems are examined using the building of a robot bicyclist as an illustrative example. The robot was to train itself to ride a bicycle moving at a constant speed. Results show that after six attempts the robot taught himself to ride the bicycle. Theorems and proofs are also given. E.H.W.

N72-10208# Joint Publications Research Service, Washington, D.C.
TWO-PERSON GAMES WITH A FIXED SEQUENCE OF TURNS
Yu. B. Germeyyer *In* Its Cybernetics and Regulation Theory 3 Sep. 1971 p 7-12 refs (See N72-10206 01-10)
(UDC-518-9) Avail: NTIS

The difficulties involved in working out decisions in two person games are investigated. The games are concerned with conflict situations with nonopposing interests and are based on the use of equilibrium points. E.H.W.

N72-10209# Joint Publications Research Service, Washington, D.C.
PROBLEMS OF LINEAR DYNAMIC PROGRAMING c19
Yu. P. Ivanilov and A. I. Propoy *In its* Cybernetics and Regulation Theory 3 Sep. 1971 p 13-18 (See N72-10206 01-10)
(UDC-517-949-21-519-35-62-50) Avail: NTIS

Dual equations dealing with a pay-off indicator are used to illustrate the difficulty involved in solving linear dynamic programming problems with control variables. A canonical economic interpretation is used to solve the dual system and to set up numerical methods of solving programming problems which may be finite or iterative. E.H.W.

N72-10210# Johns Hopkins Univ., Baltimore, Md. Research Program in Computer Systems Architecture.
METHODS FOR REALIZING SEQUENTIAL MACHINES ON IDENTICAL INTEGRATED CIRCUITS Hopkins Computer Research Reports No. 7
S. P. Kartashev Apr. 1971 52 p Presented at the Polytech. Inst. of Brooklyn 21st Intern. Symp. on Computers and Automata, Apr. 1971
(Contract AT(30-1)-4209)
(NYO-4209-7; Conf-710422-1; RR-7) Avail: NTIS

Assignment techniques are developed for optimal realization for a given sequential machine with integrated circuits. Based on a definition of equivalence equations, the following topics are investigated: (1) necessary and sufficient conditions of normal realization for arbitrary sequential machines, (2) techniques for putting irregular sequential machines into regular form, and (3) assignment algorithms for regularized sequential machines. F.O.S.

N72-10211# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
STEPWISE VARYING DELAY LINES Final Report **[LIGNES A RETARDS DISCRETEMENT VARIABLES RAPPORT FINAL]**
E. Dieulesaint and D. Chauvin [1970] 61 p In FRENCH Sponsored by Direc. de Rech. et Moyens d'Essai
Avail: NTIS

A device comprised of a multiple amplification delay line and an echo selector was designed. The line transforms a 2 microsecond duration 450 MHZ signal into a set of 6 microsecond pulses for a duration of 500 microseconds. The echo selector is coupled to this line without attenuation at 450 MHz. The boundary between the two materials provides for the transmission of shear waves. The best results were obtained with phenylbenzoate. ESRO

N72-10212# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris.
AUTOMATIC PLOTTING OF CARRIER CONCENTRATION PROFILES IN SEMICONDUCTOR THIN FILMS Final Report **[TRACE AUTOMATIQUE DE PROFILS DE CONCENTRATION EN PORTEURS DANS DES COUCHES MINCES SEMI-CONDUCTRICES COMPTE RENDU FINAL]**
M. Dugue 22 Mar. 1971 74 p refs In FRENCH Sponsored by Direc. de Rech. et Moyens d'Essai
Avail: NTIS

An instrument is designed for measuring the charge carrier density profiles in epitaxy layers. The design technique is applied to the fabrication of Schottky diodes, optimum treatment of epitaxy substrates, and improvement of deposition methods. ESRO

N72-10213# California Univ., Berkeley. Electronics Research Lab.
JOINT SERVICES ELECTRONICS PROGRAM Final Report, 16 Mar. 1968 - 30 Apr. 1971
D. J. Angelakos and J. R. Whinnery 30 Jun. 1971 104 p
(Grant AF-AFOSR-1488-68; AF PROJ. 4751)
(AD-727805; ERL-71-3; AFOSR-TR-71-1808) Avail: NTIS CSCL 09/3

Research projects are described under the following headings: Bioelectronics; Electromagnetic radiation and propagation; Electron microscopy; Integrated circuits; Quantum and optical electronics; Solid-state and electron devices; Systems and computer sciences. GRA

N72-10214# Naval Postgraduate School, Monterey, Calif.
METHODS OF SUBOPTIMAL CONTROL FOR LINEAR REGULATORS USING OUTPUT FEEDBACK M.S. Thesis
David Thomas Cowdrill Mar. 1971 89 p refs
(AD-727675) Avail: NTIS CSCL 12/1

Methods are discussed for optimal and suboptimal control of linear regulator systems employing controllers which use only accessible states and which can be easily realized. The conditions required for stability of such systems are shown and an algorithm is introduced for determining the elements of a stabilizing constant-gain matrix. This matrix provides an initial point for a technique which sub-optimizes the performance of systems with infinite-time performance measures. The concept of partial canonic state feedback is introduced in which a Luenberger observer obtains missing canonic state information which is combined with the plant output to form a feedback vector. Also given is an extension of an existing algorithm for determining piecewise-constant gains to include switching times as variable parameters. Examples are given to numerically illustrate the concepts and results. Author (GRA)

N72-10215# Mitre Corp., McLean, Va.
ATTRACTION/REPULSION FORCES IN A SINGLE-SIDED LINEAR INDUCTION MOTOR
J. K. Dukowicz Mar. 1971 33 p refs
(Contract DOT-7-35248)
(PB-200685; FRA-RT-71-78; MITRE-WP-7519) Avail: NTIS CSCL 09C

Calculations of the normal force-to-thrust force ratio are made for some simple one-dimensional LIM secondary models, (i.e., effects of finite geometry are not considered). The principal result is the determination of the cross-over when the normal force changes from being attractive to being repulsive. At this point, one-sided LIMs begin aiding the guidance/support system instead of opposing it. The results indicate that for a single-sided LIM similar to the TACRV/ADLIM, the normal force is repulsive for almost the entire operating range. This is less true for a low speed LIM. Author (GRA)

N72-10216# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.

APPLICATIONS OF IDENTIFICATION AND CONTROL METHODS Ph.D. Thesis

James H. Dube May 1971 224 p refs
(Contract F44620-68-C-0021; AF Proj. 7921)
(AD-725052; AFOSR-71-1796TR) Avail: NTIS CSCL 07/1

The work presented in this dissertation was conducted in an effort to achieve improvement in conventional and digital control methods applied to chemical processes. Emphasis was placed on simplicity and effectiveness in an attempt to provide control improvements which are easily implemented and yet efficient in their tasks. In these studies digital simulation was used exclusively utilizing the IBM 7040 and 360 and the XDS Sigma V computers. Initially the inaccuracies involved in obtaining a first-order plus dead time model graphically from an open loop response curve are discussed. Second, the subject of linear discrete models applied to sampled-data systems is considered. Third, the implementation of linear discrete models in Deadbeat, Dahlin and Kalman controller synthesis methods are presented; and fourth, utilizing the speed of the multiple linear regression identification, the application of this technique in an adaptive control scheme is presented. Author (GRA)

N72-10217# Illinois Univ., Urbana. Coordinated Science Lab.

ON MULTITRANSMISSION NETWORKS

Franco P. Preparata May 1971 28 p refs
(Contract DAAB07-67-C-0199)
(AD-725023; R-506; UILU-ENG-71-2209; R-506) Avail: NTIS CSCL 09/5

The paper considers the problem of designing networks whose function is the simulataneous transmission of k independent signals over k vertex-disjoint paths (k-transmission). All paths are assumed to consist of two edges and to traverse an intermediate vertex (bus). Necessary and sufficient conditions are obtained for realizability of a k-transmission, which are then used for establishing a lower bound to the number of transmission edges for given numbers of stations and busses. The sufficient condition is also used for the design of optimal and suboptimal k-transmissions. Finally the problem of the realization of multitransmissions is considered under the hypothesis of edge failures: conditions, bounds and design methods are described for the special case of single edge failure. Author (GRA)

N72-10218# University of Southern Calif., Los Angeles. School of Engineering.

APPLICATION OF A GENERAL THEORY OF EXTERNALS TO OPTIMAL CONTROL PROBLEMS WITH FUNCTIONAL DIFFERENTIAL EQUATIONS Ph.D. Thesis

Herbert Heinrich Buehler Jun. 1971 148 p refs
(Grant AF-AFOSR-1029-67; AF PROJ. 9749)
(AD-725044; AFOSR-71-1779TR) Avail: NTIS CSCL 12/1

Two typical optimal control problems are formulated in which the system dynamics are described by a functional differential equation. Necessary conditions which solutions to each of these two problems must satisfy are derived and stated. The type of functional differential equations considered in each problem are those with hereditary dependence in the state variables and ordinary dependence in the control variables, i.e., functional differential equations whose right hand sides may depend on the present value of the control. Particular examples of this type of functional differential equations are many differential-difference and integro-differential equations. In addition to a functional differential equation, the first problem contains fixed initial and terminal times, equality and inequality constraints on the initial and final values of the phase coordinates and an inequality type of restriction on the phase coordinates; the second problem differs from the first in that the terminal time is open and the restricted phase coordinate constraint is omitted. Author (GRA)

N72-10219# School of Aerospace Medicine, Brooks AFB, Tex.

STATISTICAL CHARACTERISTICS OF FREQUENCY-IMPULSE MODULATORS [STATISTICHESKIE KHARAKTERISTIKI CHASTOTNO-IMPULSNYKH MODULYATOROV]

V. I. Dubas 1971 24 p refs Transl. into ENGLISH from the Russian
(AD-725324; SAM-TT-R-1086-0571) Avail: NTIS CSCL 12/1

The frequency-impulse modulator (CHIM) presents a system with impulsive or continuous adjustment of the period of regulation, i.e., the period of regulation is a certain function (in the case of impulse adjustment) or a function (in the case of continuous adjustment) of the input signal. For computing the variable period of regulation, a computing device VU is used, which achieves thus the fundamental impulse modulation. GRA

N72-10220# School of Aerospace Medicine, Brooks AFB, Tex.

STATIONARY FORCED CONDITIONS IN CONTROL SYSTEMS WITH FREQUENCY PULSE MODULATION AND ANALYSIS OF THEIR STABILITY [STATSIONAPNYE VYNUZHGENNYE REZHIMY V SISTEMAKH UPRAVLENIYA S CHASTOTNO-IMPULSNOI MODULYATSIEI I ANALIZ KH USTOICHIVOSTI]

B. M. Kuntsevich 1971 20 p refs Transl. into ENGLISH from the Russian
(AD-725325; SAM-TT-R-1087-0571) Avail: NTIS CSCL 12/1

The goal of the present study is an analysis of the mode of tracking a linearly increasing control signal in unstable control systems with frequency-pulse modulation time, used in combination with either modulation of pulses by sign (CHIM systems), or in combination with modulation of pulses by width and by sign (systems with dual pulse modulation). GRA

N72-10221# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

COMPARATIVE SENSITIVITY OF OPTIMAL CONTROL SYSTEMS

Eliezer Kreindler Jun. 1971 82 p refs
(AD-725394; RE-408J) Avail: NTIS CSCL 12/1

Mathematical models of dynamic systems, such as aircraft, are always approximate. In addition, the parameters in the model may be inaccurate and change with operating conditions. Clearly, sensitivity to such parameter variations is highly undesirable and, traditionally, negative feedback has been used to reduce such sensitivity. Optimal controls are usually computed as functions of time and a particular initial state and initial time; this is an open-loop solution. If the dependence on the particular initial state and time is eliminated, one obtains the optimal control as a function of the current state and time - a feedback solution. The feedback solution has the advantage that it automatically corrects errors and tends to counter disturbances. It is also less sensitive. In what precise state should the sensitivity be measured. This report summarizes known results, mostly due to the author, on the sensitivity comparison of open-loop and closed-loop optimal control systems. Author (GRA)

N72-10222# Illinois Univ., Urbana. Coordinated Science Lab.

SENSITIVITY IMPROVEMENT OF FEEDBACK SYSTEMS

J. B. Cruz, Jr. and N. Sundararajan May 1971 33 p refs
(Contract DAAB07-67-C-0199; Grants AF-AFOSR-1579-68; NSF GK-3893)
(AD-725441; R-509) Avail: NTIS CSCL 12/1

Nominally equivalent control realizations consisting of linear combinations of open-loop and state feedback control for a linear time-invariant completely controllable plant are considered. Two controls are said to be nominally equivalent if they are equal for nominal values of plant parameters. The main result of the paper is a development of a procedure for determining a semi-closed loop control which is nominally equivalent to a given semi-closed loop control and which is less sensitive to plant parameter perturbations than the given control. The given semi-closed loop control realization includes open-loop and closed-loop realizations as special cases. Sensitivity reduction is achieved by specifying the change in the feedback matrix in terms of the solution of an algebraic matrix Riccati equation. The corresponding open-loop portion of the control is changed to maintain nominal equivalence. The restructured semi-closed loop system is always stable. When the nominal control is optimal, the sensitivity reduction described in the paper generalizes the one given by Kreindler for optimal closed-loop control compared to the optimal open-loop control. Author (GRA)

N72-10223# California Univ., Los Angeles. School of Engineering and Applied Science.
EXISTENCE AND NECESSARY CONDITIONS FOR INFINITE DIMENSIONAL CONTROL PROBLEMS INVOLVING MAXIMUM DEVIATION
John Baziw (TRW Systems Group, Redondo Beach, Calif.) and Agit Choudhury (Md. Univ., College Park) Jun. 1971 9 p refs
(Grant AF-AFOSR-1547-68; AF Proj. 9749)
(AD-725774; AFOSR-71-1847TR) Avail: NTIS CSCL 12/1

The paper contains a discussion of a class of distributed parameter control problems in which it is desired to minimize the maximum deviation of the state from some desired response. The state equation is governed by a linear evolution equation and the control is distributed over the time and spatial domain. Conditions for the existence of optimal controls are obtained by formulating the control problem as a minimum norm problem in the dual of a normed linear space. Necessary conditions which the optimal controls must satisfy are then obtained by considering the dual maximization problem. Finally, the auxiliary moment problem, which is obtained by approximating the L sub infinity norm by the L sub p norm, is discussed as an epsilon-variational problem. Author (GRA)

N72-10224 National Lending Library for Science and Technology, Boston Spa (England).
LARGE SCALE INTEGRATION (LSI): THE ELECTRONICS OF THE SEVENTIES
L. Oedman 19 Aug. 1971 14 p Transl. into ENGLISH from Elteknik (Stockholm), no. 2, 1969 p 6-9
(NLL-PORS-Trans-2789-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The four methods - manual construction, discretionary wiring, building block, and micro matrix - used to construct LSI circuits are examined. The economics of computer design and testing of such circuits is also given. E.H.W.

N72-10225 National Lending Library for Science and Technology, Boston Spa (England).
THEORY AND SIMULATION OF A PCM NETWORK WITH MUTUALLY SYNCHRONIZING GENERATORS
A. Darre and O. Karl 19 Aug. 1971 13 p refs Transl. into ENGLISH from NTZ-Nachrtech. Z. (Brunswick), v. 25, no. 5, 1970 p 257-261
(NLL-PORS-Trans-2756-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Mathematical models were used to construct a network of generators that are mutually synchronized on the phase averaging principle. It was shown that such networks can be subject to enforced synchronism, remain unconditionally stable if regulation between two nodes always takes place in both directions, and information transfer is not disturbed by regulating and switching operations. E.H.W.

N72-10226 National Lending Library for Science and Technology, Boston Spa (England).
FAILURE DIAGNOSIS IN MODULAR SYSTEMS WITH STORED PROGRAMS
B. Lampe 19 Aug. 1971 10 p refs Transl. into ENGLISH from Elektron. Rechenanlagen (West Germany), n. 12, no. 3, Jun. 1970 p 150-154
(NLL-Trans-2763-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The possibilities of fully automatic failure tracing in systems are pointed out with a modular structure and a suitable redundancy. The program structure is described. The automation effects of failure diagnosis on system availability are also reviewed. Author

N72-10227 Stanford Univ., Calif.
THE NEAR-MINIMUM-TIME CONTROL OF OPEN-LOOP ARTICULATED KINEMATIC CHAINS Ph.D. Thesis
Michael Edwin Kahn 1970 183 p
Avail: Univ. Microfilms Order No. 70-18425

The time optimal control of a system of rigid bodies connected in series by single degree of freedom joints is investigated. The problem is reduced to one of determining when to reverse the controls during a given motion. A suboptimal feedback control is developed to provide a close approximation to the optimal control. The control is expressed in terms of switching curves for each of the system controls. Digital simulation is used to obtain a comparison of response times of the optimal and suboptimal controls. The speed of response of the suboptimal control is found to compare favorably with the response speed of the optimal control. The suboptimal system is applied to the control of three joints of a mechanical manipulator. Modifications of the suboptimal control for use in a sampled-data system are shown to result in good performance of a hydraulic manipulator under computer control. Dissert. Abstr.

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N72-10228# Tri-Univ. Meson Facility, Vancouver (British Columbia).
TRIUMF: ANNUAL REPORT, 1970
N. Brearley, ed. Apr. 1971 62 p refs
(NP-18870) Avail: AEC Depository Libraries

Recent developments on construction, the TRIUMF experimental facility, cyclotron design and engineering, safety features, and the central-region cyclotron model are reported. In addition, information on project management and scheduling, organization and committees, conferences, reports and publications, staff, financial conditions, and users' groups is included. NSA

N72-10229*# Princeton Univ., N.J. Guggenheim Aerospace Propulsion Labs.
PULSED ELECTROMAGNETIC GAS ACCELERATION Semiannual Report, 1 Jan. - 30 Jun. 1971
Robert G. Jahn, Woldemar F. VonJaskowsky, and Kenn E. Clark Jul. 1971 87 p refs
(Grant NGL-31-001-005)
(NASA-CR-123295; SAR-634q) Avail: NTIS CSCL 14B

Experimental data were combined with one-dimensional conservation relations to yield information on the energy deposition ratio in a parallel-plate accelerator, where the downstream flow was confined to a constant area channel. Approximately 70% of the total input power was detected in the exhaust flow, of which only about 20% appeared as directed kinetic energy, thus implying that a downstream expansion to convert chamber enthalpy into kinetic energy must be an important aspect of conventional high power MPD arcs. Spectroscopic experiments on a quasi-steady MPD argon accelerator verified the presence of A(III) and the absence of A(I), and indicated an azimuthal structure in the jet related to the mass injection locations. Measurements of pressure in the arc chamber and impact pressure in the exhaust jet using a piezocrystal backed by a Plexiglas rod were in good agreement with the electromagnetic thrust model. Author

N72-10230# Oak Ridge National Lab., Tenn.
INDEXED BIBLIOGRAPHY OF LITERATURE ON SEISMIC CONSIDERATIONS IN THE SITING OF NUCLEAR FACILITIES-1
W. C. McClain and O. H. Myers Jun. 1971 374 p refs
(Contract W-7405-eng-26)
(ORNL-NSIC-88; RO-178; NSIC-2-00071; NSIC-2-49979) Avail: NTIS

Abstracts concerning seismological considerations in the siting of nuclear facilities are presented. A keyword index and an author index to the abstracted material are also included. NSA

N72-10231# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A SYSTEM FOR DILUTION OF ROCKET OXIDIZERS
Stanley D. Erk, Sr. (SysteMed Corp., Dayton, Ohio) and Lloyd W. Kaczmarek (SysteMed Corp., Dayton, Ohio) Dec. 1970 10 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970
(Contract F33615-70-C-1046; Proj. 6302)
(AD-727512; AMRL-TR-70-102-Paper-9) Avail: NTIS CSCL 14/2

A system was designed and built to dilute highly reactive and extremely toxic rocket oxidizers safely. This system accomplished the operations of accurate pressure measurement, vapor transfer, precise addition of inert gas, secure storage of pure and diluted oxidizers, and decontamination of excess material with minimal toxicological and explosion hazard to personnel. Author (GRA)

N72-10232# Metropolitan Washington Council of Governments, D.C.
MARKETING ACCESS SERVICES: BALTIMORE-WASHINGTON REPORT NO. 1: IMMEDIATE AIRPORT ACCESS STUDY ACTION IMPROVEMENTS
1970 25 p Sponsored by Metropol. Washington Council of Govt.
(PB-200686; P-010) Avail: NTIS CSCL 05E

Short term airport access improvements in the Baltimore-Washington area, are studied with the design and implementation of a suitable access services brochure. Current access services at the region's airports and at nonregion airports; functional requirements for information dissemination; brochure contents; distribution possibilities; and financial and management aspects of brochure development, maintenance, and dissemination are considered. GRA

N72-10233# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF A DAYTIME COCKPIT FOG SIMULATOR Final Report, Apr. 1969 - May 1971
Morris Ritter Nov. 1971 35 p refs
(Proj. 073-323-04X)
(FAA-NA-71-44; FAA-RD-71-82) Avail: NTIS

An evaluation was conducted to determine the suitability of a daytime cockpit fog simulator to accurately and realistically simulate Category II and Category III weather conditions to the pilot during flight approaches. Thirteen pilots, using a DC-7 aircraft, participated in the program. The fog simulator was evaluated during atmospheric meteorological visibilities ranging from 1.5 to over 12 miles. Technical data, as well as completed pilot questionnaires, comprised the data analyzed. Although the simulator shows merit insofar as projecting realism, a redesign of the unit is necessary to correct deficiencies in various optical, electronic, and mechanical areas. Author

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N72-10234# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
INFLUENCE OF ULTRASOUND ON VAPOUR BUBBLE DYNAMICS IN LIQUID HYDROGEN
L. G. Tkachev and V. D. Shestakov 1971 19 p refs In RUSSIAN; ENGLISH summary
(JINR-P13-5751) Avail: AEC Depository Libraries

The following assumptions are made: a bubble is spherical and homogeneous; vapor is in thermodynamic equilibrium with the surface layer of the liquid; and the liquid is incompressible and isotropic. The system of equations takes into account heat and mass exchange between a bubble and the liquid. The state equation contains the second and third virial coefficients. The numerical solutions of the system of equations are given for the case of liquid hydrogen. Since the solutions are studied in the asymptotical region where the size of the bubble is 0.001 cm, the initial bubble is taken equal to 0.0005 cm, and the surface tension is neglected. The properties of solutions are discussed with the various values of thermodynamic and acoustic parameters corresponding to the working conditions of the ultrasonic bubble chamber. The mechanism of bubble growth is rectified by heat diffusion. By taking into account the property of real gas, a larger bubble is obtained compared to that of an ideal gas. Author (NSA)

N72-10235# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
SLIP FLOW IN ONE-DIMENSIONAL GAS CENTRIFUGES [STROEMUNGSMECHANISCHE VORGAENGE IN GASZENTRIFUGEN]
E. Krause and E. H. Hirschel [1970] 9 p refs Transl. into ENGLISH of DFVLR, Porz, W. Germany, conf. paper In GERMAN and ENGLISH Presented at DFVLR Coll. on Flow in Gas Centrifuges, Porz, W. Germany, 14 May 1970
(Conf-700557-2; Capenhurst-Trans-250) Avail: AEC Depository Libraries

Approximate solutions are presented of flow equations for compressible binary gas mixtures in one-dimensional gas centrifuges. The gas mixture is moved between two infinitely long coaxial cylinders. Assuming that dependence of the transport coefficients on temperature and concentration can be neglected, the solutions are valid for continuum and slip (Gleit) flow. Particular attention is given to the dependence of the separation factor on the peripheral velocity of the inner cylinder, the wall temperature, and the Knudsen number. Author (NSA)

N72-10236*# Techtran Corp., Glen Burnie, Md.
PRECISION OF THE BUBBLE PRESSURE METHOD FOR THE DETERMINATION OF THE SURFACE TENSION OF LIQUIDS [PRAEZISIERUNG DER BLASENDRUCKMETHODE ZUR BESTIMMUNG DER OBERFLAECHENSPANNUNG VON FLUESSIGKEITEN]
K. H. Cuny and K. L. Wolf Washington NASA Nov. 1917 29 p refs Transl. into ENGLISH from Ann. Physik (Leipzig), v. 17, 1956 p 57-77
(Contract NASw-2037)
(NASA-TT-F-13937) Avail: NTIS CSCL 20D

The hypotheses are discussed, based on the comparison of

the approximate procedure of Schroedinger and the numerically developed expression, for maximum bubble pressure derived directly from the Gauss-Laplace differential equations. From these considerations a new viewpoint is derived for the construction and operation of a differential testing procedure. After critical considerations of previous devices, an apparatus is described which allows the precise absolute determinations as well as serial relative determinations with great precision.
Author

N72-10237# Oxford Univ. (England). Lab. of Engineering.
SOME NUMERICAL SOLUTIONS IN UNSTEADY PIPE FLOW
R. J. Pope 1971 19 p refs
(Rept-1019/71) Avail: NTIS

Numerical techniques of solving partial differential equations are applied to several problems in fully developed pipe flow. The Navier-Stokes equations are written exactly for viscous, incompressible, uniform fluid flow. Velocity profiles in the pipe are plotted for a flow starting from rest and a parabolic flow stopping or coming to rest. By writing the differential equations in terms of mean flow, solutions can be obtained to a pipe flow specified only as a mean-flow pulse. Such solutions have applications to physiological flow pulses in the aorta provided the neglect of entry length effects is justified. Author (ESRO)

N72-10238# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
KAZAN. AVIATION INSTITUTE. TRANSACTIONS (SELECTED ARTICLES).
I. I. Kalmykov, K. A. Kosterin, I. P. Motylinksii, and B. A. Rogozhin 16 Mar. 1971 56 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (USSR), no. 98, 1968 p 3-14, 67-77, 107-119
(Project FTD-6060201)
(AD-727451; FTD-MT-24-09-71) Avail: NTIS CSCL 20/4

Contents: Theoretical analysis of the high-pressure stage of an ejector with a conical mixing chamber; Lateral jet expansion in a separated flow; Calculating the burnout behind a jet-flame stabilizer. GRA

N72-10239# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
DEVELOPMENT OF TURBULENT BOUNDARY LAYERS ALONG THE CURVED WALLS OF AN ANNULAR DIFFUSING PASSAGE Turbomachinery Components Research Program
S. Fujii (Natl. Aerospace Lab., Tokyo) and T. H. Okiishi Aug. 1971 48 p refs Backup document for AIAA Synoptic, "Curved Diffusing Annulus Turbulent Boundary Layer Development," scheduled for publication in Journal of Aircraft in Feb. 1972
(ERI Proj. 636)
(ISU-ERI-AMES-71033) Avail: NTIS

Turbulent boundary layer development along the curved walls of an axisymmetric diffusing annulus was determined experimentally and compared with results calculated using a form of the von Karman momentum integral boundary layer equation and several sets of simple auxiliary equations. Based on the comparisons made, one iterative solution method for predicting curved wall annular diffuser boundary layer growth that yields fair results is proposed. Author

N72-10240# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
A THEORETICAL STUDY OF WALL COOLING EFFECTS UPON SHOCK WAVE-LAMINAR BOUNDARY LAYER INTERACTION BY THE METHOD OF LEES-REEVES-KLINEBERG
B. G. Gautier and J. J. Ginoux May 1971 94 p refs
(VKI-TN-71) Avail: NTIS

The integral method of Lees and Reeves-Klineberg was used to study the effect of changes of wall temperature ratio upon wall pressure and heat transfer distributions of a shock wave - laminar boundary layer interaction generated by a two-dimensional deflected surface. A parametric study was carried out to determine the effect of progressive changes in the wall cooling ratio. In particular, a linear reduction of the separation length with the surface cooling ratio was demonstrated.
Author (ESRO)

N72-10241# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CAVITATIONAL EROSION IN HYDRAULIC TURBINES
Yu. A. Grivnin and Yu. U. Edel 8 Feb. 1971 22 p refs Transl. into ENGLISH from Energomashinostroenie (Moscow), v. 16, no. 1, 1970 p 5-8
(FTD Proj. 7343)
(AD-724974; FTD-MT-24-270-70) Avail: NTIS CSCL 10/1

The status of scientific research studies in the field of cavitational erosion is discussed; basic results of some studies are presented and evaluated from the viewpoint of applicability to hydraulic turbines. It is shown that the erosion process is significantly different for different forms of cavitation. GRA

N72-10242# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
LONGITUDINAL DISPERSION IN NON-UNIFORM FLOW
Harry H. Carter and Akira Okubo Nov. 1970 55 p refs
(Contract N00014-67-A-0163-0006; NR Proj. 083-016)
(AD-724798; Ref-70-8; TR-68) Avail: NTIS CSCL 20/4

Non-uniform flow is a flow in which the velocity at any given time changes from point to point along a streamline. In estuaries, such flows result from the cross-sectional area increasing in the downstream direction. A solution to the convective-diffusion equation for this type of estuary is obtained in terms of the estuarine geometry and the longitudinal diffusion coefficient. The model is applied to the results of two dye tracer experiments carried out in the upper Patuxent River during August 1969 from which the longitudinal dispersion coefficients were quantitated. The concept of a flushing velocity for an estuary is developed and defined. Author (GRA)

N72-10243# Ohio State Univ. Research Foundation, Columbus.
PARTICULAR SOLUTIONS FOR SLOW VISCOUS FLOWS CLOSE TO SOLID BODY ROTATION. ANALYTIC DISCUSSION AND EXAMPLES Final Report
Karl G. Guderley (ARL) and Norman L. Soong Wright-Patterson AFB, Ohio ARL Feb. 1971 239 p refs
(Contract F33615-67-C-1758; AF PROJ. 7071-00-20)
(AD-725072; ARL-71-0037) Avail: NTIS CSCL 20/4

Particular solutions for slow viscous flows close to solid body rotation are found by product hypotheses which lead to two different eigenvalue problems. The adjoint equations and orthogonality conditions are derived. For high values of the Ekman number some of the particular solutions can be interpreted as the contribution of the Ekman layer. A simplified differential equation is derived for the interior of the flow field; it is valid if the Ekman number is large. The effect of the Ekman layer is taken into account by modified boundary conditions. For a problem studied by Stewartson, the solution is expressed in terms of both kinds of particular solutions. Also discussed are flow patterns in which the formation of striation is inhibited. Further examples show flow fields with perturbation introduced along cylindrical boundaries. Examples using the complete solutions are given; certain discontinuities of the schematic flow fields are smoothed out. Also discussed is the relation between these solutions and a solution with different boundary conditions due to Morrison and Morgan. Author (GRA)

N72-10244# Max-Planck-Institut fur Stromungsforschung, Gottingen (West Germany).
THE BEHAVIOR OF VISCOUS WALL FLOW IN TURBULENT BOUNDARY LAYERS [DAS VERHALTEN DER VISKOSEN WANDSTROEMUNG IN TURBULENTEN GRENZSCHICH-

TEN]
H. Reichardt Jun. 1971 24 p refs in GERMAN; ENGLISH summary Presented at the DGLR Meeting on Boundary Layers, Goettingen, West Ger., 8 Jun. 1971
(Rept-6/1971) Avail: NTIS

Fluctuations of the viscous shear stress near a wall are governed by a differential equation of the heat conduction type, which follows from the general equations of motion. This differential equation is solved in order to explain effects observed in the viscous sublayer with hot film probes. A solution function is found for the shear stress showing that shear stress waves don't originate at the wall, but in the semi-viscous region. Their propagation in the y direction is attenuated exponentially reaching a minimum at the wall. ESRO

N72-10245# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
TURBULENT JET FLOWS
1971 343 p refs
(VKI-LS-36) Avail: NTIS HC $6.00/MF $0.95

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11. LASER BEAM USAGE FOR OPTO-ELECTRONIC METHODS OF INVESTIGATING GASEOUS FLOWS H. J. Pfeifer (Inst. Franco-Allemand de Recherches, St. Louis, France) 21 p refs (See N72-10256 01-16)

N72-10246# Surrey Univ., London (England).
A REVIEW OF THEORETICAL AND EXPERIMENTAL WORK ON THE DEVELOPMENT OF TURBULENT JETS
L. J. S. Bradbury *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 38 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

Turbulent jet development and turbulent shear flows are considered to which boundary layer approximations apply. Only two dimensional flows are analyzed so that the influence of a bounding wall is not taken into account. The Reynolds number is always assumed to be sufficiently large and the viscous stresses are negligible compared to turbulent stresses. Author

N72-10247# Surrey Univ., London (England).
TURBULENCE SIMILARITY IN A PLANE JET IN A MOVING AIRSTREAM
L. J. S. Bradbury *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 21 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

The assumption that the turbulence structure is always similar in shear flows provides a useful alternative hypothesis to the more usual gradient transport models of turbulence. The spread of a plane jet in a parallel moving airstream is studied using this assumption with the intention of critically examining the accuracy and usefulness of the similarity hypothesis. Although the similarity argument does not seem to account for the development of this flow in an accurate quantitative manner, it certainly describes some of the broad features of the flow development and the results establish the considerable influence of upstream history on the development of free shear flows. Author

N72-10248# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
REMARKS ON TURBULENT FLOWS WITH FREE STREAM BOUNDARIES
J. Mathieu *In its* Turbulent Jet Flows 1971 89 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

Turbulence effects are analyzed in flows which possess at least one free boundary enabling the process of contamination of the irrotational fluid by the turbulent fluid to take place. Considered are flows that are not restricted by the presence of a solid wall such as jets, mixing layers, and wakes, as well as flows which are completely restricted by walls imposing on the whole of the flow rather severe constraints. Emphasis is placed on the mechanism of the free surface. G.G.

N72-10249# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
WALL JETS AND THEIR APPLICATION TO BOUNDARY LAYER CONTROL
I. S. Gartshore *In its* Turbulent Jet Flows 1971 35 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

Existing methods for predicting wall jet development are briefly outlined and an analysis on boundary layer control requirements for a particular airfoil section with two blowing slots is presented. Integral techniques are used to evaluate the effects of large upstream boundary layers on wall jet development. It is concluded that reasonable accurate predictions of boundary layer and wall jet development are possible when no distinct minimum appears in the velocity profile. G.G.

N72-10250# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
SELF-PRESERVING FLOWS
I. S. Gartshore *In its* Turbulent Jet Flows 1971 26 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

The concept of self-preservation is applied to analyze flows in which molecular viscosity is unimportant in governing the motion and for which the usual boundary layer approximations apply. Both axisymmetric and plane two dimensional jets and wakes are considered but only plain boundary layers and wall jets. Only constant density isothermal statistically steady situations are included. The assumption of self-preserving forms for the velocity and Reynolds stress distribution allows the mean equation of motion to be written as an ordinary differential equation, and permits predictions of the length and velocity scales for the flow. Mean velocities and turbulent velocities are assumed in the x, y directions respectively, where y may be a radial coordinate in axisymmetric motion. The exponent r differentiates axisymmetric results ($r=1$) from plane two dimensional cases ($r=0$). Flow measurements in plane and axisymmetric self-preserving jets and wakes, and in plane wall jets and boundary layers confirm the relationship between profile shape and pressure gradient given by the analysis. At least some of the Reynolds stresses exhibit self preserving distributions at various streamwise positions. G.G.

N72-10251# Technische Univ., Berlin (West Germany).

HOT-WIRE MEASUREMENT TECHNIQUE: SOME BASIC PROBLEMS c14

J. D. Vagt *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 53 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

The different requirements which should be fulfilled by a hot wire probe of sufficient efficiency are summarized for an optimal configuration as follows: (1) length of the wire about 1 mm; (2) diameter of the wire 2.5 to 5 micrometers; and (3) platinum plated tungsten with copper plated ends for wire material. Accurate calibration of the hot wire requires an airstream with variable velocity and low turbulence. G.G.

N72-10252# Imperial Coll. of Science and Technology, London (England).

TRANSMISSION OF LOW FREQUENCY JET PIPE SOUND THROUGH A NOZZLE FLOW c23

J. E. FfowcsWilliams *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 8 p (See N72-10245 01-12)
(jefw/69) Avail: NTIS HC $6.00/MF $0.95

The basic flow model is subsonic jet of velocity V sub 2 formed by expanding a hot jet pipe flow of mean velocity V sub 1 and static pressure p sub 1 in a jet pipe of cross sectional area A sub 1 through a nozzle down to the ambient pressure p sub o. The jet flows in the direction + x. Superimposed on this basic flow is a low frequency sound wave of pressure p(+) incident from x less than o. The meaning of the low frequency in this context is that the nozzle scale is much smaller than the wavelength in both the jet stream and the environment. The problem is to determine the unsteady conditions at the nozzle exit and the sound field radiated to the static homogeneous environment exterior to the jet. It is shown that the influence of the nozzle transmission properties on the velocity depends on the velocity of the aerodynamic sound; aerodynamic sources contained within the jet but positioned many wavelengths upstream of the nozzle generate sound depending on jet velocity in precisely the same way as if the sources were in direct communication with the nozzle exterior. G.G.

N72-10253# Imperial Coll. of Science and Technology, London (England).

JET NOISE AT VERY LOW AND VERY HIGH SPEED c23

J. E. FfowcsWilliams *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 9 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

A description of the possible sources of sound that can be met in low Mach number jet flows, and their strength is given in terms of flow parameters. Considered is jet noise at very low speed where nozzle exit turbulence may be a major contributor. Lighthill's theory is briefly summarized and used to estimate the sound of jets at moderate speeds. It is shown that very reasonable estimates of the field can be achieved from a crude description of the turbulent flow without recourse to the more involved aspects of the quadrupole theory. Then the question of noise produced by combustion of excess fuel in the exhaust is examined according to Lighthill's theory. The theory is applied to high Mach number situations where it is argued that the role of both Mach waves and shock waves needs further study. Finally, estimates of the sources to be expected in a moderate speed jet issuing from a multitube suppressor are made and applied to the noise from a fully developed jet flow. Author

N72-10254# Rolls-Royce, Ltd., Bristol (England). Bristol Engine Div.

ON THE NOISE SOURCES OF THE UNSUPPRESSED HIGH SPEED JET c23

K. A. Bishop, J. E. FfowcsWilliams (Imperial Coll. of Sci. and Technol.), and W. Smith *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 17 p refs (See N72-10245 01-12)
(ARC-32723; F.M.4211; N.730) Avail: NTIS HC $6.00/MF $0.95

An interpretation of jet noise theory and scale model experiments to highlight physical properties of jet noise sources at very high speed are presented. The principal noise sources are shown to be very large scale wave-like undulations of the jet flow that travels downstream at supersonic speed for a distance of several jet diameters. These motions are relatively well ordered and are probably more akin to recognizable instabilities of a laminar flow than the confused small scale turbulence. A model of the noise generating motions as the instability products of a jet flow of low equivalent Reynolds number is formulated. This Reynolds number is based on an eddy viscosity and can be futher reduced by artificially increasing the small scale turbulence level. This step stabilizes the flow and inhibits the formation of large scale noise producing eddies. Author

N72-10255# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

NUMERICAL METHODS FOR JET FLOWS

R. Borghi *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 24 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

Phenomena which induce and control the transfers of mass, momentum, and enthalphy are considered in numerical calculation methods for turbulent jet flows. Analyzed are two dimensional axisymmetrical steady flows of isobaric jets, jets where the transverse pressure gradient is approximately zero, and nonisobaric jet flows. G.G.

N72-10256# Institut Franco-Allemand de Recherches, St. Louis (France).

LASER BEAM USAGE FOR OPTO-ELECTRONIC METHODS OF INVESTIGATING GASEOUS FLOWS c16

H. J. Pfeifer *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 21 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

Three laser beam techniques for gas dynamic analyses are described: (1) the beam deflection method that uses refractivity to determine density gradients in flows; (2) laser beam correlations for measuring both velocity and coherence length of phase structures in a flow; and (3) the Doppler difference method for measuring the velocity of gases in a flow. G.G.

N72-10257# Naval Ordnance Lab., White Oak, Md.

STUDY OF BOUNDARY-LAYER FLOWS WITH PRESSURE GRADIENT AND MASS TRANSFER BY A SIMPLE INTEGRAL METHOD

Tse-Fou Zien 22 Mar. 1971 47 p refs
(AD-725133; NOLTR-71-51) Avail: NTIS CSCL 20/4

A refined Karman-Pohlhausen method previously generalized by Zien to include the effects of mass transfer is further explored and its application is extended to cases involving both pressure gradients and surface mass transfer. The case with piece-wise suction (or blowing) is also included. The study is restricted to plane, incompressible, laminar boundary layers. Configurations of flat plates and circular cylinders are chosen to illustrate the application of the method. Results are given mainly in terms of skin frictions, and they are presented entirely in closed forms. The calculations for the porous plate case are carried out using rather elaborate velocity profiles, but the results differ negligibly from previous ones with very simple profiles. A linear velocity profile is then used to carry out some exploratory calculations for more complex flows. The method is shown to be a potentially efficient tool for handling the problem of boundary-layer control by means of surface mass transfer. Author (GRA)

N72-10258# Naval Research Lab., Washington, D.C. Physical Oceanography Branch.

THE WAKE OF A SOURCE IN A TWO-LAYER FLUID

J. M. Bergin 20 May 1971 49 p refs
(NEL Proj. A37-370/F08-125-703)
(AD-725109; NRL-7254) Avail: NTIS CSCL 20/4

The purpose of the report is to provide an analytical basis for evaluation of the internal wave system generated by a moving body in stratified fluids which can be represented by a two-layer structure. In view of the standard representation of rigid bodies by a distribution of hydrodynamic sources, the objective is achieved by developing analytical expressions for the disturbance due to a single source. Expressions are derived for the velocity field. The method of stationary phase, when applied to these expressions, yields a simplified description of the field far behind the source. An additional quantity, the displacement function, is introduced in order to describe the amount by which fluid particles are displaced in the vertical direction from their equilibrium position. Author (GRA)

N72-10259# Aerospace Corp., El Segundo, Calif. Plasma Research Lab.
EFFECTS OF SHOCK WAVE DECELERATION ON IONIZATION LEVELS IN A SHOCK TUBE Technical Report, Jul. 1970 - 1 Feb. 1971
Glenn C. Light 15 Jun. 1971 21 p refs
(Contract F04701-70-C-0059)
(AD-725733; TR-0059(6220-10)-12; SAMSO-71-113TR) Avail: NTIS CSCL 20/4

Measurements of electron density behind a decelerating shock wave in air in a shock tube are presented. A model is proposed that accounts for the effects of shock wave deceleration and boundary layer mass loss on shocked gas properties in a self-consistent manner. Calculated values of electron density based on this model are within a factor of 2 of measured values. Consequences of the combined effects of shock deceleration and boundary layer mass loss are seen to be of great importance for shock tube studies involving the determination of chemical reaction rates. Author (GRA)

N72-10260# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EFFECT OF A RISE IN STAGNATION TEMPERATURE ON THE GAS FLOW AROUND DEEP CAVATIES
Iu. B. Eliseev and A. Ia. Cherkez [1971] 14 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 3, 1971 p 8-18
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Results of experiments with hollow models inserted in a stationary gas flow are analyzed. Some quantitative characteristics of the effect of a temperature rise above the value of the free stream stagnation temperature are determined. It is shown that this phenomenon is associated with the formation of shocks in the cavity, wherein energy dissipation results in the gradual heating of the gas and the model walls. Author

N72-10261*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL WAKE SURVEY BEHIND VIKING 1975 ENTRY VEHICLE AT ANGLES OF ATTACK OF 0 DEG AND 5 DEG, MACH NUMBERS FROM 1.60 TO 3.95, AND LONGITUDINAL STATIONS FROM 1.0 TO 8.39 BODY DIAMETERS
Clarence A. Brown, Jr., James F. Campbell, and Dorothy H. Tudor Washington Oct. 1971 308 p refs
(NASA-TM-X-2312; L-7758) Avail: NTIS HC $6.00/MF $0.95 CSCL 20D

An investigation was conducted to obtain flow properties in the wake of the Viking '75 entry vehicle at Mach numbers from 1.60 to 3.95 and at angles of attack of 0 deg and 5 deg. The wake flow properties were calculated from total and static pressures measured with a pressure rake at longitudinal stations varying from 1.0 to 8.39 body diameters and lateral stations varying from -0.42 to 3.0 body diameters. These measurements showed a a consistent trend throughout the range of Mach numbers and longitudinal distances and an increase in dynamic pressure with increasing downstream position. Author

N72-10262 Harvard Univ., Cambridge, Mass.
THEORY OF COLLECTION OF AIRBORNE PARTICLES BY FIBROUS FILTERS Ph.D. Thesis
Stanley Verne Dawson 1969 252 p
Avail: Univ. Microfilms Order No. 70-15306

Predictions for collection of airborne particles by fibrous filters are calculated from theoretical mechanics of the filtration process. The theory is expected to apply to the case of respirable particles in the air stream passing through arrays of specially uniform glass fibers. For available patterns of flow around the typical fiber, the flow resistivity predicted on the basis of the customary assumption of uniform solidity in the filter is compared to published measurements of resistivity. The disagreement is resolved by proposing that a parallel flow through paths of different solidity has occurred in the filter. In the mathematical model chosen, the paths of parallel flow are each of uniform solidity and the pattern of flow around the typical fiber is that of Spielman and Goren (1968). Dissert. Abstr.

N72-10263 Pennsylvania State Univ., University Park.
DEVELOPING FLOW WITH COMBINED FORCED-FREE CONVECTION IN AN ISOTHERMAL VERTICAL TUBE Ph.D. Thesis
Burton Zeldin 1969 116 p
Avail: Univ. Microfilms Order No. 70-19493

The continuity, momentum, and energy equations were solved simultaneously without recourse to boundary layer approximations for both uniform, irrotational and fully developed entrance velocity models by use of a finite difference technique. The difference equations formed by Allen's method were solved iteratively by use of a successive over-relaxation algorithm. for either entrance velocity, it was assumed that the fluid entrance temperature is uniform but different from that of the wall. In addition, the tube was presumed to be long enough to permit the velocity to eventually become fully developed. Velocity profiles and Nusselt numbers are presented for air for both pure forced and combined forced-free convection. Both the analysis and a related experiment were limited to flows in which the tendency of gravity is to accelerate the fluid near the tube wall. Dissert. Abstr.

N72-10264 Washington Univ., Seattle.
A STUDY OF THE MEAN FLOW CHARACTERISTICS OF GAS-SOLID SUSPENSIONS FLOWING IN VERTICAL TUBES Ph.D. Thesis
Ted Joseph Kramer 1970 346 p
Avail: Univ. Microfilms Order No. 70-19634

An experimental and theoretical study of the flow characteristics of gas-solid suspensions was conducted. Air and particle velocities and particle flux distributions were measured across vertical tubular flow channels. The suspension static pressure gradient along the tube axis was also measured. The three suspensions studied consisted of air and spherical glass particles having average diameters of 30, 62, and 200 microns. Flow channels were 0.5, 0.75, and 1.0 inch diameter glass tubes. Air Reynolds numbers ranged from 5670 to 50,000. A universal logarithmic suspension velocity profile was predicted by the theoretical flow model based upon the assumption that the suspension could be treated as a continuum. The data points calculated from the experimental measurements formed a family of logarithmic profiles with the mass loading ratio as parameter and each profile was found to be independent of the air Reynolds number. Dissert. Abstr.

N72-10265 Purdue Univ., Lafayette, Ind.
MAXIMUM THRUST NOZZLES FOR ROTATIONAL OR NONEQUILIBRIUM SIMPLE DISSOCIATING GAS FLOWS INCLUDING BOUNDARY LAYER EFFECTS Ph.D. Thesis
Michael Peter Scofield 1970 174 p
Avail: Univ. Microfilms Order No. 70-18579

A formulation, numerical solution technique and computer program implementing the technique are presented for the design of maximum thrust nozzles for rotational or nonequilibrium simple dissociating gas flows including boundary layer effects. The formulation is based on the usual assumptions applicable to rotational and nonequilibrium simple dissociating gas flows and on the assumption that the boundary layer is thin. The thrust is written as the integral of the stress tensor acting along the supersonic nozzle wall on which a general isoperimetric design constraint is also applied. The thrust expression is maximized by application of the calculus of variations. The resulting set of design equations are hyperbolic partial differential equations valid in the region of interest and algebraic equations specifying the boundary conditions for the Lagrange multipliers of the extremal problem. Dissert. Abstr.

N72-10266 Carnegie-Mellon Univ., Pittsburgh, Pa.

WAVES AND STABILITY IN VISCOUS AND INVISCID COMPRESSIBLE LIQUIDS CONTAINED IN RIGID AND ELASTIC TUBES BY THE METHOD OF EIGENVALLEYS (VOLUMES 1-3) Ph.D. Thesis

Henry August Scarton 1970 797 p
Avail: Univ. Microfilms Order No. 70-18029

Thirty-two modes of propagation of waves in viscous compressible liquids contained in rigid circular tubes were calculated. Sixteen of these modes are transverse modes, the existence of which was unexpected. These modes were computed over a wide range of frequencies, viscosities, and wavelengths. The modes were found through the development of a computer-aided contour technique for finding the complex roots of complex transcendental equations. This technique, called the Method of Eigenvalleys, also led to the discovery of backward propagating waves; an exact analytical expression for the zeroth transverse mode eigenvalue; a definitive low-intermediate and intermediate-high frequency boundary; a new type of boundary layer, called a dilatational boundary layer; the exact linear synthesis of tube end conditions; and a theorem and corollary which can handle any number of homogeneous radial boundary conditions. Dissert. Abstr.

N72-10267 Kansas State Univ., Manhattan.

SLUG-FLOW TEMPERATURE DISTRIBUTIONS IN A RECTANGULAR DUCT FOR AN INCOMPRESSIBLE FLUID FLOWING UNDER THE INFLUENCE OF A PULSATING PRESSURE GRADIENT Ph.D. Thesis

Ru-Hsin Mo 1970 119 p
Avail: Univ. Microfilms Order No. 70-19206

The development of the temperature field of a pulsating, laminar flow of an incompressible, Newtonian fluid in a long, rigid, straight, rectangular duct is analytically investigated. Analytical solutions of temperature distributions for the case of constant wall temperature and for the case of uniform wall heat flux are obtained. From the results obtained, it is found that if the magnitude of the amplitude of the oscillating component of pressure gradient is not larger than the steady-state component, the effect of pulsations of the flow on the temperature field are diminished when the value of the frequency parameter increases. Numerical results are given which demonstrate the effect of the aspect ratio of the duct, the effect of the amplitude and frequency of the pulsating pressure gradient and the influence of the fluid Prandtl number on the temperature field of the flow. Some significant results are graphically illustrated. Dissert. Abstr.

N72-10268 Purdue Univ., Lafayette, Ind.

A STUDY OF AXISYMMETRIC, INCOMPRESSIBLE, DUCTED JET ENTRAINMENT Ph.D. Thesis

Gene Logan Minner 1970 272 p
Avail: Univ. Microfilms Order No. 70-18696

An investigation of constant area, ducted jet mixing was performed. Information is presented on the global and detailed flow field behavior. Two geometric conditions were considered with primary to mixing tube diameter ratios of $d/D = 0.1$ and 0.4 and a fixed mixing duct length, $L/D = 8.4$. The third condition was one of mild recirculation. For measurement of the global behavior, the primary velocity was varied, and the resulting secondary flow rate was measured. A simplified control volume analysis was used to predict the global behavior, with the secondary velocity predicted as a function of the primary velocity and the secondary static pressure rise. For a fixed geometry condition, the secondary velocity is a linear function of the primary velocity. Detailed velocity measurements of the flow field were made. Theoretical predictions of the flow field behavior are presented. Dissert. Abstr.

N72-10269 California Univ., Berkeley.

THE ANALYSIS OF LAMINAR WAKES IN SUPERSONIC FLOW BY THE METHOD OF INTEGRAL RELATIONS Ph.D. Thesis

James Cheng-Sun Meng 1969 120 p
Avail: Univ. Microfilms Order No. 70-17620

The singular points in the recompression region of the wake behind a hypersonic re-entry body (with a flat base) are analyzed using the Method of Integral Relations. It is shown that the critical point just downstream of the wake reattachment point is a saddle point. Integral curves are generated connecting this point with the base flow region. All viscous effects are neglected upstream of the base shoulder; downstream of it a Chapman type solution is used to connect the integrals issuing from the saddle points. A suitable matching of flow parameters yields a unique near wake solution. Two sample cases are carried through in detail. Good agreement with the experimental results is found. Dissert. Abstr.

N72-10270 Tufts Univ., Medford, Mass.

ANALYTICAL AND EXPERIMENTAL STUDY OF THE APPLICATION OF THE METHOD OF WEIGHTED RESIDUALS TO TWO DIMENSIONAL BOUNDED FLOW AT MODERATE REYNOLDS NUMBER Ph.D. Thesis

Jung-Ho Lee 1969 122 p
Avail: Univ. Microfilms Order No. 70-18006

The mathematical techniques are developed involved in formalizing a general method to find successive approximations in the problem of regular perturbation of an equation using the method of weighted residuals (MWR). The applicability of MWR was also examined in specific applications in the field of fluid mechanics. As a particular case, the Collocation method of MWR was applied to the incompressible two-dimensional slow viscous flow generated in the gap between two non-concentric circular cylinders, with the outer rotating at constant angular velocity and the inner stationary, for a range of small Reynolds number. Predicted results were substantially confirmed by experimental observations. The outer and inner cylinders in these experiments had diameters of 5.75 in. and 0.75 in. respectively. In order to get the appropriate Reynolds number in each experiment, the rotating speed of the outer cylinder was controlled in the range of 0.01 approximately 10 rpm and similar silicon oils with viscosity of 60,000 cs and 10,000 cs were used. Dissert. Abstr.

N72-10271 State Univ. of New York at Buffalo.

MECHANISM OF SLUG FORMATION IN HORIZONTAL TWO-PHASE FLOW Ph.D. Thesis

Eugene S. Kordyban 1969 176 p
Avail: Univ. Microfilms Order No. 70-17342

The theoretical and experimental study of the mechanism of transition from wavy to slug flow in two-phase horizontal two-dimensional flow is reported. It is proposed that the transition to slug flow occurs due to a type of Kelvin-Helmholtz instability, i.e., the instability which occurs when the suction due to aerodynamic pressure at the wave crest overcomes the downward acceleration of the wave. In this case, this is enhanced by the proximity of the upper wall. The suction at the crest grows faster than the downward force on a liquid element, so that the instability is amplitude dependent. Since the surface waves possess a limiting amplitude, for a given liquid level, air velocity, and wave length, the transition can be predicted by examining whether the highest possible waves are unstable. Dissert. Abstr.

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N72-10272*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ROCKET MEASUREMENTS OF ION AND ELECTRON DENSITIES IN THE D- AND LOWER E-REGIONS NEAR SUNRISE

A. Pedersen (ESTEC, Noordwijk, Neth.) and J. A. Kane Paris ESRO Mar. 1971 27 p refs
(NASA-TM-X-67409; ESRO-SN-116) Avail: NTIS CSCL 04A

Positive-ion and electron densities were measured in the 75 to 110 km altitude range with the aid of two rockets launched from White Sands near sunrise. The solar zenith angles were 91 and 79 deg respectively. The densities were derived from measurements made by an ion collector and from data obtained with a Faraday rotation technique capable of detecting electrons in the D-region. It has been found that in the 80-95 km altitude range, electron detachment from negative ions takes place mainly at zenith angles of less than 91 deg. The source of the high positive-ion density (N(+) approximately 700/cu cm) at an altitude of 75 km just before sunrise is presumed to be scattered Lyman alpha radiation which is ionizing nitric oxide.
Author (ESRO)

N72-10273*# Biospherics, Inc., Rockville, Md.

STUDY OF THE POSSIBLE ROLE OF POLLUTION IN THE PREVALENCE OF SEA NETTLES IN THE CHESAPEAKE BAY AND THE DEVELOPMENT OF A CENSUS TAKING METHOD Final Report

15 Oct. 1971 137 p refs Original contains color illustrations
(Contract NASw-2115)
(NASA-CR-123293) Avail: NTIS CSCL 08A

A study of the effect of pollutants on the sea nettle population of Chesapeake Bay was conducted. The effects of pollutants on the polyp stage of the nettle were stressed. Methods of detecting adult sea nettles by remote sensing are discussed. The effects of phosphate, nitrate, ammonium, and combinations of these pollutants were investigated. Author

N72-10274* National Aeronautics and Space Administration, Washington, D.C.

NASA TO SURVEY EARTH'S RESOURCES

Richard T. Mittauer 20 Oct. 1971 29 p
(NASA-News-Release-71-202) Avail: NTIS CSCL 22B

A wide variety of the natural resources of earth and man's management of them will be studied by an initial group of foreign and domestic scientists tentatively chosen by the National Aeronautics and Space Administration to analyze data to be gathered by two earth-orbiting spacecraft. The spacecraft are the first Earth Resources Technology Satellite (ERTS-A) and the manned Skylab which will carry an Earth Resources Experiment Package (EREP). In the United States, the initial experiments will study the feasibility of remote sensing from a satellite in gathering information on ecological problems. The objective of both ERTS and EREP aboard Skylab is to obtain multispectral images of the surface of the earth with high resolution remote sensors and to process and distribute the images to scientific users in a wide variety of disciplines. The ERTS-A, EREP, and Skylab systems are described and their operation is discussed.
Author

N72-10275*# Texas A&M Univ., College Station. Remote Sensing Center.

LABORATORY MEASUREMENT OF THE COMPLEX DIELECTRIC CONSTANT OF SOILS

M. L. Wiebe Oct. 1971 35 p refs
(Contract NAS9-11155; Grant NGL-44-001-001)
(NASA-CR-123294; RSC-23) Avail: NTIS CSCL 08M

The dielectric constant of a material is an extremely important parameter when considering passive radiometric remote sensing applications. This is because the emitted energy measured by a microwave radiometer is dependent on the dielectric constant of the surface being scanned. Two techniques of measuring dielectric constants are described. The first method involves a dielectric located in air. The second method uses basically the same theoretical approach, but the dielectric under consideration is located inside a section of waveguide. Author

N72-10276*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AIRCRAFT MEASUREMENTS OF MICROWAVE EMISSION FROM ARCTIC SEA ICE

T. Wilheit, J. Blinn (JPL), W. Campbell (US Geol. Surv.), A. Edgerton (Aerojet-Gen. Corp.), and W. Nordberg Sep. 1971 25 p refs Submitted for publication
(NASA-TM-X-65742; X-651-71-417) Avail: NTIS CSCL 08K

Measurements of the microwave emission from Arctic Sea ice were made with aircraft at 8 wavelengths ranging from 0.510 cm to 2.81 cm. The expected contrast in emissivities between ice and water was observed at all wavelengths. Distributions of sea ice and open water were mapped from altitudes up to 11 km in the presence of dense cloud cover. Different forms of ice also exhibited strong contrasts in emissivity. Emissivity differences of up to 0.2 were observed between two types of ice at 0.811 cm wavelength. The higher emissivity ice type is tentatively identified as having been formed more recently than the lower emissivity ice. Author

N72-10277# Australian Atomic Energy Commission, Coogee.

SAFETY AND ENVIRONMENTAL ASPECTS OF NUCLEAR ENERGY

D. W. Crancher, D. J. Higson, and L. H. Keher [1971] 22 p refs Presented at the 43rd Congress of the Australian and New Zealand Assoc. for the Advancement of Sci., Brisbane, Australia, 24 May 1971
(Conf-710511-1) Avail: AEC Depository Libraries

Sources of environmental pollution are discussed, and a comparison is made between radioactive pollutants from nuclear industry and the pollution potential of alternative energy sources, including natural sources of contamination. Sources of air and thermal pollution are reviewed, and the generation and control of active wastes arising from mining and treatment of uranium ore, enrichment and fabrication of fuel, fission products, and fuel reprocessing is described. Environmental surveillance programs and measures taken to protect against accidents are discussed.
NSA

N72-10278# Belgian Royal Observatory, Brussels.

SIXTH INTERNATIONAL SYMPOSIUM ON EARTH TIDES [SIXIEME SYMPOSIUM INTERNATIONAL SUR LES MAREES TERRESTRES]

Rene Dejaiffe, ed. 1970 243 p refs Partly in FRENCH, ENGLISH, and GERMAN Symp. held at Strasbourg, France, 15-20 Sep. 1969 *Its* Commun. Ser. A, no. 6 and Geophys. Ser. no. 96
Avail: NTIS

Systematic studies of earth tides on a global scale are presented. Discussed are various indicating instruments and their utilization and reliability, causes of unequal measurements reported from different stations, indirect effects of oceans on tide measurements, and localized phenomena in tidal tilt measurements. For individual titles, see N72-10279 through N72-10319.

N72-10279# Kyoto Univ. (Japan).

OBSERVATION OF TIDAL VARIATION OF GRAVITY MADE IN SUOWA STATION, ANTARCTICA

Ichiro Nakagawa, Seiichi Kakinuma, Keizo Yanai (Tohoku Univ.),

and Yasoichi Endo (Hokkaido Univ.) *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 16719 (See N72-10278 01-13)
Avail: NTIS

Tidal variation of gravity was observed in Antarctic by means of a gravimeter. It was carried out by visual reading at about one hour intervals during a period of 7 days from June 18, 07h to June 25, 07h, 1968 (UT), the number of readings being 169. The data obtained and the corresponding computed tides on a perfectly rigid earth were analyzed by the least squares method and were compared with each other. It was then found that the tidal factor of gravity and phase lag are 1.376 and -3 deg. 73 min. for K sub 1 constituent and 1.145 and -3 deg. 16 min. for O sub 1 constituent, respectively. Author

N72-10280# Belgian Royal Observatory, Brussels.
PRELIMINARY RESULTS ON EARTH TIDES AT SPITZBERG [RESULTATS PRELIMINAIRES DE MESURES DES MAREES TERRESTRES AU SPITZBERG]
P. Melchior, M. Bonatz, and J. Blankenburgh *In its* Sixth Intern. Symp. on Earth tides 1970 p 20 Repr. from Ciel Terre (Uccle), v. 86, no. 2 p 85-99 In FRENCH (See N72-10278 01-13)
Avail: NTIS

Preliminary evaluations of earth tide registrations by horizontal pendulums at a ground station in the Arctic Ocean are discussed. Indirect effects were considerable in weak semi-diurnal waves but did not disturb markedly amplitudes of maximal diurnal gravity waves. Definite pendulum azimuth values are not yet determined. Transl. by G.G.

N72-10281# Institut de Physique du Globe, Paris (France).
STUDY OF TIDAL INCLINATIONS AT A STATION POSITIONED IN THE CENTER OF THE SAHARA: PRELIMINARY RESULTS [ETUDE DE LA MAREE D'INCLINAISON DANS UNE STATION SITUEE AU CENTRE DU SAHARA: RESULTATS PRELIMINAIRES]
P. A. Blum *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 21-22 refs In FRENCH (See N72-10278 01-13)
Avail: NTIS

The influence of oceanic and atmospheric tides on pendulum measuring sites in the Algerian Sahara is studied. Preliminary analyses of registered tilt values show that principal NS and EW wave propagations are characterized by the force and the frequency band during transmission reflecting regional irregularities Transl. by G.G.

N72-10282# Institut de Physique du Globe, Paris (France).
FIRST RESULTS FROM A SURVEY OF CLINOMETRIC TIDAL MEASUREMENTS IN EAST FRANCE [PREMIERS RESULTATS D'UNE CAMPAGNE DE MESURE DE LA MAREE CLINOMETRIQUE DANS L'EST DE LA FRANCE]
R. Lecolazet, L. Steinmetz, and G. Wittlinger *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 23-26 refs In FRENCH; ENGLISH summary (See N72-10278 01-13)
Avail: NTIS

The first results concerning three clinometric stations of the easterly part of France are analyzed. The amplitudes and phase displacements observed in the easterly part of the Parisian basin are similar to those observed in the south of Belgium and near Paris. The results concerning the Voges stations are clearly different. Specially Bussang results offer a very important phase lag (north south components). Author

N72-10283# Working Group for Comparing the Gravimeters in Japan.
SIMULTANEOUS OBSERVATIONS OF EARTH TIDES WITH FOUR ASKANIA AND TWO LACOSTE AND ROMBERG GRAVIMETERS IN MIZUSAWA
In Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 27-29 (See N72-10278 01-13)
Avail: NTIS

A gravimetric survey on earth tides is reported from Japan. Simultaneous gravimetric measurements were performed with different gravimeters for calibrating scale constants and for comparing their characteristics. Examination of obtained values for tidal factors and phase lag established no remarkable differences between the measuring instruments. G.G.

N72-10284# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORT ON SOME INVESTIGATIONS CONCERNING GRAVIMETER RECORDINGS IN FRANKFURT am MAIN
R. Brein *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 30-36 refs (See N72-10278 01-13)
Avail: NTIS

An electric spring was installed in a gravimeter for electrical measurements of earth tide gravitational differences. Comparison of obtained recordings with those from a regular gravimeter established no systematic differences in the relation of tides between the results of the two gravimeters. G.G.

N72-10285# Geodetic Inst., Helsinki (Finland).
THE FINNISH EARTH TIDE STATIONS
Pentti Groehn *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 37-38 refs (See N72-10278 01-13)
Avail: NTIS

Gravimeter and pendulum registrations are reported from several geodetic stations in Finland. The mean values of obtained tidal factors are shown in table form. Standard deviations are considerably large. G.G.

N72-10286# Mizusawa International Latitude Observatory (Japan).
OBSERVATIONS OF EARTH TIDES IN MIZUSAWA
Chikara Sugawa and Kennosuke Hosoyama *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 39-41 (See N72-10278 01-13)
Avail: NTIS

Gravimeter and pendulum measurements of earth tides are reported from a ground station in Japan. The horizontal pendulum was set in a cave and the gravimeter with automatic recording apparatus was positioned in an underground room. Several experiments and investigations concerning the stability of the instruments, precise determination of the scale constant, indirect effect of oceanic tides, and methods of harmonic analysis were performed and mean values of the tidal factors are given in table form. G.G.

N72-10287# Kyoto Univ. (Japan).
SOME PROBLEMS ON EARTH TIDES OBSERVED WITH A GRAVIMETER
Ichiro Nakagawa and Masanori Shiraki (Kakioka Magnetic Obs.) *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 42-49 refs (See N72-10278 01-13)
Avail: NTIS

Three methods of analysis of earth tides - Lecolazet's least squares and Fourier integral's - were compared with each others using one month's data obtained with an Askania gravimeter in Kyoto, Japan. Both a modified Lecolazet's method to exclude systematic errors of analysis and the least squares method assumed seven components of the tides and gave excellent results in gravimetric factor and phase lag, using hourly values covering the duration of one month. Observational data obtained were analyzed continuously by means of the modified Lecolazet's method. These analyses show a similar variation in gravimetric factor and phase lag as a part of seasonal variation in comparison with previous observations. The present results for gravimetric factors give greater values than the previous ones. This suggests secular change or long period variation in the gravimetric factor. Author

N72-10288# Lamont-Doherty Geological Observatory, Palisades, N.Y.

TIDAL GRAVITY MEASUREMENTS ALONG A TRANSCONTINENTAL PROFILE ACROSS THE UNITED STATES

John T. Kuo, Robert C. Jachens, Gale White, and Maurice Ewing *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth tides 1970 p 50-60 refs (See N72-10278 01-13)
Its Contrib. no. 1567 Avail: NTIS

The results from analyzing data obtained from the network of a transcontinental profile for the principal tidal constituents sub M2 and sub O1 have shed light on the problem of the predominant indirect influence of ocean tides on the earth tidal theory. The observed values of the gravimetric factor and phase were found to depend on the tidal characteristics of the Atlantic and the Pacific oceans. There are no observable correlations between tidal gravity parameters and regional geology. By taking into account the influence of ocean tides only, the gravimetric factors and phases for all the transcontinental stations, for the first time, are brought into a consistent system in the framework of the earth tidal theory. Author

N72-10289# California Univ., La Jolla.

TIDAL TO SEISMIC FREQUENCY INVESTIGATIONS WITH A QUARTZ ACCELEROMETER OF NEW GEOMETRY

Barry Block and Robert D. Moore *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 61-72 refs (See N72-10278 01-13)
(Contract AF 49(638)-1388; Grant NFS GA-1245)
Avail: NTIS

A wideband, tidal to seismic frequency, accelerometer has been developed which is of simple internal geometry and low drift. Initial tidal and earth mode frequency investigations are described along with detailed design features and internal noise measurements. Author

N72-10290# Akademiya Nauk URSR, Kiev.

TIDAL TILTS IN THE TIEN-SHAN

S. M. Fandjushina *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 73-83 refs (See N72-10278 01-13)
Avail: NTIS

Observations of tilts by gravimeters aim to study slow crystal earth movements and possible forerunners of earthquakes. Analyses of the tidal part of tiltmeter observations carried out in central U.S.S.R. established different values for the gamma (M sub 2) NS component with 12% less than for the same component in EW direction. This difference is attributed to local anomalies. G.G.

N72-10291# Akademiya Nauk URSR, Kiev.

TIDAL TILTS AT THE EAST FERGANA

V. N. Yakovlev *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 84-85 (See N72-10278 01-13)
Avail: NTIS

Evaluation of photoelectric tiltmeter measurements of earth tides by harmonic analysis of monthly series as well as by sliding harmonic analysis of the most continuous row of observations in one point are reported. Results show a variety in the behavior of the various waves with especially strong variations in azimuth NS. This was attributed mainly to faults in mountain rocks close to the points of observations. G.G.

N72-10292# Akademiya Nauk URSR, Kiev.

OBSERVATIONS OF TIDAL GRAVITY VARIATIONS IN ASIAN REGIONS OF THE USSR

N. N. Pariisky, S. N. Barsenkov, V. A. Volkov, P. G. Gridnev, M. V. Kuznetsov, L. Kuznetsova, B. P. Pertsev, and J. K. Sarytcheva *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 86-89 refs (See N72-10278 01-13)
Avail: NTIS

Observations of tidal gravity variations by gravimeters in central Asia are evaluated. Comparison of results obtained for different waves show that phase lags for semidiurnal and diurnal waves do not agree with each other. These peculiarities can not be explained by the effect of atmospheric pressure. G.G.

N72-10293# Akademiya Nauk URSR, Kiev.

TIDAL TILTS OF THE EARTH BY OBSERVATIONS IN THE USSR

A. E. Ostrovsky and P. S. Matveev *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 90-94 refs (See N72-10278 01-13)
Avail: NTIS

Observation of tidal tilts on the territory of the USSR in a great number of points located in different geological and geographic conditions have shown that the main reason of the difference of amplitudinal factor gamma in different points is explained by mechanical properties of mountain rocks where the chamber was set for observations of tidal tilts. Great local anomalies of gamma are obtained in observations on mountain openings in the shafts and adits made in rigid rocks. The least scatter in gamma is obtained in observations in shafts made in soft rock sands and clays. The second reason of scatter of the value gamma in observations in different points is variation of air temperature and heating of soil roughness by Sun. An especially great temperature effect is observed in the component N-S. The mean value of the amplitudinal factor calculated from observations in 28 points is close to 0.7, more exact gamma = 0.683 + or - 0.007. Author

N72-10294# Akademiya Nauk URSR, Kiev.

SLOW AND TIDAL DEFORMATIONS OF THE EARTH SURFACE ACCORDING TO TILT OBSERVATIONS AT THE SAYANY STATION

I. A. Shirokov and A. E. Ostrovsky *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 95-96 refs (See N72-10278 01-13)
Avail: NTIS

Tilt observations from a remote region in Siberia were carried out in deep equipped adits made in mountain massifs. Measurements were obtained by 12 tiltmeters with photoelectric registrations; isolations of slow tilts were made by analyses of tiltmeter drift records. Vertical displacements of the margins of tectonic zones in microns per year were calculated and are shown in tables together with measurements of slow deformations. Corrections for the effects of oceanic tides were made. G.G.

N72-10295# Akademiya Nauk URSR, Kiev.

ON THE EFFECT OF TEMPERATURE ON TIDAL TILTS OF THE EARTH'S SURFACE

K. M. Anokhina and A. E. Ostrovsky *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 97-100 refs (See N72-10278 01-13)
Avail: NTIS

An attempt is made to trace variations of the gamma factor with time by 13 month series of observations and to analyze the reasons affecting the change of this value from month to month. Harmonic analysis of tiltmeter photographic tide recordings shows that summer observations subjected to the temperature effect do not give the real value of the gamma factor for the diurnal wave K sub 1 and the M sub 2 wave; diurnal and semi-diurnal thermal tilts sharply distort the gamma factor. G.G.

N72-10296# Institut de Physique du Globe, Paris (France).

REGIONAL STUDY OF OCEANIC EFFECTS ON THE TILT. FIRST RESULTS FROM THE MOULIS STATION [ETUDE REGIONALE DE L'INFLUENCE OCEANIQUE SUR L'INCLINAISON. PREMIERS RESULTATS A LA STATION DE MOULIS]

P. A. Blum and D. Hatzfeld *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 102-105 refs In FRENCH (See N72-10278 01-13)
Avail: NTIS

Spectral analyses of continuous tidal registrations by two horizontal pendulums positioned near oceanic bays established that short periodic waves develop during M sub 2 propagation between the ground stations. This is attributed to regional anisotropies. Transl. by G.G.

N72-10297# Dominion Observatory, Ottawa (Ontario).
SOME NUMERICAL RESULTS IN THE DETERMINATION OF THE INDIRECT EFFECT
D. R. Bower *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 106-112 refs (See N72-10278 01-13)
Avail: NTIS

The principal disturbance in earth tide measurements is that due to the loading and attraction effects of the ocean tides. Presented are improved methods for predicting these indirect effects at a given point. Preliminary results obtained on the assumption of a Boussinesq solution for the elastic deformation at 300 sites throughtout the area are shown. The perturbations in gravity computed for 5 European stations and for Ottowa are included. Author

N72-10298# Akademiya Nauk URSR, Kiev.
THE EFFECT OF OCEAN TIDES UPON EARTH-TIDE OBSERVATIONS
B. P. Pertsev *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 113-115 refs (See N72-10278 01-13)
Avail: NTIS

Calculations show that the effects of ocean tides on the results of analysis of gravity and tiltmeter tidal observations are quite perceptible even for continental stations. Identical results obtained by both methods suggest that the reliability of the corrections principally depends on the quality of the initial data. The absence of tidal data for small far off areas of the sea cannot change the values of the corrections essentially. But the same can't be said beforehand about the effect of the Mediterranean and even more so, the polar seas, which have not been taken into account in the calculations. The tides in these seas can have a noticeable effect, especially on corrections to tiltmeter observations in the N-S component. Author

N72-10299# Liege Univ. (Belgium).
STUDY OF THE DRIFT IN DIFFERENT TYPES OF HORIZONTAL PENDULUMS OBSERVED AT THE KANNE STATION (LIÈGE UNIVERSITY) FROM 1966 TO 1969, FOR THE E-W COMPONENT [ETUDE DE LA DERIVE DE PENDULES HORIZONTAUX DE TYPES DIFFERENTS OBSERVEE A LA STATION DE KANNE (UNIVERSITE DE LIEGE) DE 1966 A 1969, EN COMPOSANTE E.-O.]
L. Bragard *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 117-135 refs In FRENCH; ENGLISH summary (See N72-10278 01-13)
Avail: NTIS

The observations show the main of an instrumental cause (square screw and sensitivity lever) and the intermittent influence of a geophysical cause (sudden variations of the atmospheric pressure) in the phenomena of the tilt drift. Author

N72-10300# Belgian Royal Observatory, Brussels.
MECHANICAL BOUNDARY VALUE PROBLEM FOR CORRECTION OF EARTH TIDAL OBSERVATIONS FOR INDIRECT EFFECT [DIE KORREKTUR VON ERDGEZEITEN-BEOBACHTUNGEN AUF INDIREKTE EFFEKTE ALS RANDWERTPROBLEM DER MECHANIK]
W. Buchheim *In its* Sixth Intern. Symp. on Earth Tides 1970 p 137-146 refs In GERMAN (See N72-10278 01-13)
Avail: NTIS

The stress-strain-time relationships between tidal forces in the earth interior, and pressure and temperature fluctuations at the earth's surface are considered in evaluating and correcting tidal tilt measurement evaluations by harmonic analysis. A resulting rheological curve provides qualitative information on the inelastic flexibility of the earth crust and interior; deflections of singular tides from the rheological curve are considered resonances between the tide and the body of the earth. Transl. by G.G.

N72-10301# Laboratoire de Recherches Hydrauliques, Anvers (Belgium).
DYNAMIC EFFECTS OF LIQUID CORE AS MEASURED BY HEIBAART SONDE [EFFETS DYNAMIQUES DU NOYAU LIQUIDE D'APRES LES MESURES DANS LE SONDAGE DE HEIBAART]
E. Smets *In* Belgium Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 147 In FRENCH (See N72-10278 01-13)
Avail: NTIS

Harmonic analysis of the water level fluctuation curve obtained from a tidal meter as function of time is used to study earth core motion. The profile of the obtained diagram clearly establishes oscillating tidal periods of the earth in connection with characteristic seismographic observations of an earthquake in Japan. Transl. by G.G.

N72-10302# Belgian Royal Observatory, Brussels.
RESULTS OBTAINED BY M SUB 3 WAVE [RESULTATS OBTENUS POUR L'ONDE M SUB 3]
P. Melchior *In its* Sixth Intern. Symp. on Earth Tides 1970 p 148-149 ref In FRENCH (See N72-10278 01-13)
Avail: NTIS

Derivations of the wave M sub 3 from long duration observations with 21 different gravity accelerometers are reported. Horizontal wave components for the NS and EW directions as well as vertical components obtained at the various ground stations are shown in table form. Transl. by G.G.

N72-10303# Kyoto Univ. (Japan). Geophysical Inst.
SHIDA'S NUMBER OBTAINED BY EXTENSOMETRIC OBSERVATIONS IN KAMITAKARA, JAPAN
Ichiro Nakagawa, Hikaru Doi, and Kazuo Oike *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 150-153 (See N72-10278 01-13)
Avail: NTIS

Least squares analyses are performed on earth tide registrations by various extensometer types. Comparison of amplitude and phase difference ratios between results show that extensometers of variable capacitance are in good agreement with those of horizontal pendulum type. It is concluded that there are no remarkable differences between the two methods of magnification systems. G.G.

N72-10304# California Univ., La Jolla. Inst. of Geophysics and Planetary Physics.
A LASER EARTH STRAINMETER c16
Jon Berger and R. H. Lovberg *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 154-166 refs (See N72-10278 01-13)
Avail: NTIS

A laser interferometer for the study of earth strain is described. Changes in the length of an 800 m arm are measured by counting fringes in the interference pattern with a least count of 4 x 10 to the minus 10th power. The output is linear and has a flat response from DC to 1 MHz and a dynamic range of 0.000001. The laser wavelength is controlled by reference to a passive optic resonator contained in a stable environment. The wavelength stability is a few parts in 10 to the 10th power for periods up to a laser lifetime. Author

N72-10305# Technische Universitaet, Clausthal-Zellerfeld (West Germany).
OPERATIONAL TESTS OF THE ASKANIA-BOREHOLE TILTMETER (EARTH TIDE PENDULUM) c14
D. Flach, O. Rosenbach (Goettingen Univ., West Germany), and H. Wilhelm *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 167 (See N72-10278 01-13)
Avail: NTIS

In 1968 the test-station Zellerfeld-Muhlenhohe has been installed for the first 3 Askania-borehole titlemeters. Short descriptions of the function of the tiltmeter and of the test station are given. First results of harmonic analysis and of an investigation of the ball calibration are discussed. Author

N72-10306# Institute of Coastal Oceanography and Tides, Bidston (England).

AN ANALYTICAL TECHNIQUE TO MINIMIZE NOISE IN A SEARCH FOR LINES IN THE LOW FREQUENCY SPECTRUM c19

Petr Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 170-173 refs (See N72-10278 01-13)
Avail: NTIS

The described technique is based entirely upon optimization processes using the least squares fit as a criterion. The trigonometric term is sought which best fits the given function F (usually a time series) defined on a set M sub 2 of n discrete points. For any frequency omega, the coefficients are optimized from a statistical point of view and can be found from the system of normal equations and thus expressed as functions of omega. Therefore, the summation of squares of deviations is used as a measure of fit and regarded, for any given F, as a function of frequency omega only; this provides a kind of transformation of F into the frequency space. Author

N72-10307# Environmental Science Services Administration, Miami, Fla.

TIDAL CONSTANTS DERIVED FROM RESPONSE ADMITTANCES

B. Zetler, D. Cartwright (Natl. Inst. of Oceanog., U. K.), and W. Munk (California Univ., San Diego) *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 175-178 refs (See N72-10278 01-13)
Avail: NTIS

The response method of tide prediction has previously been applied to various observed series to obtain frequency dependent admittances that describe the tidal characteristics in a similar sense to what can be deduced from traditional harmonic constants. To bridge the gap between the two methods of presentation, procedures are described on how to derive harmonic constants from the response admittances and one method is applied to a set of observed data. Author

N72-10308# Institute of Coastal Oceanography and Tides, Bidston (England).

THEORY OF MOTION OF HORIZONTAL PENDULUM WITH ZOLLNER SUSPENSION c14

Petr Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 180-182 refs (See N72-10278 01-13)
Avail: NTIS

Discussed are the changes in the free oscillatory period of a horizontal pendulum with Zollner suspension. The present theory is an attempt to throw light on the phenomenon from a theoretical aspect. Considering gravity force, reaction in suspensions against the weight of the pendulum beam, torsion and internal friction in suspension filaments, a system of differential equations is obtained and a solution is formulated. Author

N72-10309# Institute of Coastal Oceanography and Tides, Bidston (England).

CALIBRATION TESTS AND THE COMPARATIVE PERFORMANCE OF HORIZONTAL PENDULUMS AT A SINGLE STATION c14

G. W. Lennon and P. Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 183-193 refs (See N72-10278 01-13)
Avail: NTIS

Performance stabilities of several horizontal pendulums positioned in a rock vault are compared and their tidal measuring sensitivities are determined. Results show that the overall patterns of drift conform to that of the external temperature and no marked disparity is observed. The patterns produced both by instruments operating simultaneously and also consecutively are compatible. It is concluded that the observed drift represents real tilt at the geophysical station. G.G.

N72-10310# Belgian Royal Observatory, Brussels.

ON THE PRECISION OF CLINOMETRIC OBSERVATIONS ON EARTH TIDES [SUR LA PRECISION DES OBSERVATIONS CLINOMETRIQUES DE MAREES TERRESTRES]

P. Melchior *In its* Sixth Intern. Symp. on Earth Tides 1971 p 194-196 refs In FRENCH (See N72-10278 01-13)
Avail: NTIS

The various systematic or accidental error sources affecting tiltmeter earth tide measurements are discussed. Considered are effects of faulty azimuth definition, sensitivity calibration, and installation methods. Transl. by G.G.

N72-10311# Belgian Royal Observatory, Brussels.

CALIBRATION OF A GRAVIMETER BY USING A HEAVY MASS c14

Erwin Groten *In its* Sixth Intern. Symp. on Earth Tides 1970 p 197-202 ref (See N72-10278 01-13)
Avail: NTIS

The determination of the calibration factor of a recording gravimeter using a heavy steel or brass ball is described. In order to do the calibration under usual operational conditions, i.e. without any modification of the sealed meter, a small elevator is used. The aim of the procedure is a calibration where the measuring screw is not involved and which can be applied in the station without removing the gravimeter. Due to the relatively small attractional effect produced by the ball measurements of very high accuracy are needed. This is a disadvantage of the procedure. Nevertheless, an accuracy of + or - 0.001 for the calibration factor is feasible at the present state of the art. Author

N72-10312# Belgian Royal Observatory, Brussels.

EXPERIMENTAL DETERMINATION OF TIDAL WAVE PHASE DISPLACEMENT IN THE CASE OF THE ASKANIA GRAVIMETERS

B. Ducarme *In its* Sixth Intern. Symp. on Earth Tides 1970 p 203-205 refs (See N72-10278 01-13)
Avail: NTIS

The phase displacement in gravimetric tidal wave registration is analyzed. A least squares method shows that the dynamic characteristics of the galvanometer and the elastic properties of the gravimeter produce the observed registration errors. Transl. by G.G.

N72-10313# Belgian Royal Observatory, Brussels.

THE EFFECT OF PHASE CHARACTERISTICS OF ASKANIA GRAVIMETERS UPON MEASUREMENTS OF PHASE LAGS IN TIDAL OBSERVATIONS

V. A. Volkov and N. N. Pariisky *In its* Sixth Intern. Symp. on Earth Tides 1970 p 206-209 refs (See N72-10278 01-13)
Avail: NTIS

Gravimeter phase effects on phase lag measurements in tidal observations were analyzed by means of a transitory process shift in the output effect, by mobile load effects on gravimeter, and by recording gravimeter readings on vertically oscillating platforms. No final conclusions were drawn on the effect of tidal lag on Earth rotation, taking into account the discrepancies in lags for other waves which have not yet been explained. G.G.

N72-10314# Belgian Royal Observatory, Brussels.

NOTE ON THE FREQUENCY DETERMINING REGISTRATION SCALE IN EARTH TIDAL OBSERVATIONS BY ASKANIA GRAVIMETERS [NOTE SUR LA FREQUENCE DE LA DETERMINATION DE L'ECHELLE DE L'ENREGISTREMENT DANS LES OBSERVATIONS DES MAREES TERRESTRES PAR LE GRAVIMETRE ASKANIA]

P. S. Korba *In its* Sixth Intern. Symp. on Earth Tides 1970 p 210-212 refs In FRENCH (See N72-10278 01-13)
Avail: NTIS

The optimal frequency for the registration scale that insures most precise earth tide registrations by galvanometric gravimeters

is considered. The problem is solved by: determining the scaling coefficient at registration based on the known dispersion and the confidence interval of the frequency, and by estimating perturbations due to displacement of the calibration curve.
Transl. by G.G.

N72-10315# Uppsala Univ. (Sweden). Solid Earth Physics Inst.
A HORIZONTAL PENDULUM STATION WITH TILT COMPENSATION c14
Andreas Vogel *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 213-215 refs (See N72-10278 01-13)
Avail: NTIS

The design and calibration of horizontal pendulums with tilt compensation are presented. The quartz pendulum is mounted on a bearing plate and its beam reflections are recorded photographically. A mechanical device calibrates the expandable bearing plate. Records are obtained by direct recording on paper, remote electrical recording by aid of analog digital converter, or by digital recorder. G.G.

N72-10316# Belgian Royal Observatory, Brussels.
A NEW TYPE ELECTROMAGNETIC TILTMETER c14
I. Tsubokawa *In its* Sixth Intern. Symp. on Earth Tides 1970 p 217-218 (See N72-10278 01-13)
Avail: NTIS

This tiltmeter is a kind of the electromagnetic level. The sensor is a weight of aluminium plate which is supported by four metallic filaments and the frame of filaments is fixed to a vessel. The amount of displacement of core connected with the weight proportional to the inclination is electrically detected by a differential transformer. The oscillation of the weight can be damped by silicon oil which is filled in the vessel. Simultaneous observations of the earth tide with VM horizontal pendulums are made. Preliminary results of harmonic analysis by means of Lecolazet's method show good agreement in amplitude with each other, but the phase lags show some discrepancies in the present time. Author

N72-10317# Belgian Royal Observatory, Brussels.
THE DETERMINATION OF THE EFFECTS OF LONG PERIODIC EARTH TIDES ON EARTH ROTATION [LA DETERMINATION DE L'INFLUENCE DES MAREES TERRESTRES A LONGUE PERIODE SUR LA ROTATION DE LA TERRE]
Anna Stoyko and Nicolas Stoyko *In its* Sixth Intern. Symp. on Earth Tides 1970 p 222-225 refs In FRENCH (See N72-10278 01-13)
Avail: NTIS

The effective earth tide coefficients that affect earth rotation are discussed. Continuous observations of changing values for astronomical constants show that variations in earth rotation are caused by the joint action of earth tides and lunar orbit.
Transl. by G.G.

N72-10318# Belgian Royal Observatory, Brussels.
NEARLY DIURNAL NUTATION AND PERIODICAL TERMS OF LOCAL COORDINATES [NUTATION PRESQUE DIURNE ET TERMES PERIODIQUES DES COORDONNES LOCALES]
Suzanne Bebarbat *In its* Sixth Intern. Symp. on Earth Tides 1970 p 226 In FRENCH (See N72-10278 01-13)
Avail: NTIS

Short periodic nutations of earth tides are studied by evaluating their local coordinates. Astrophysical analyses of long term tidal fluctuations establish almost diurnal nutations at 23 hrs 56 min 54 sec, and at 24 hrs 09 min 50 sec daily time.
Transl. by G.G.

N72-10319# Belgian Royal Observatory, Brussels.
ON TIDAL EFFECTS IN SATELLITE GRAVITY DATA
Erwin Groten *In its* Sixth Intern. Symp. on Earth Tides 1970 p 228-233 refs (See N72-10278 01-13)
Avail: NTIS

The effect of the yielding of the earth due to luni-solar tidal acceleration on geodetic data as obtained from satellite orbit analysis is discussed. Differences between terrestrial and satellite gravity data are pointed out. The influence of the duration of stress on Love's numbers h and k is considered. Author

N72-10320# Sandia Labs., Albuquerque, N.Mex.
INVESTIGATION OF ISOTHERMAL COMPRESSIBILITY OF IGNEOUS ROCKS UNDER PRESSURES OF UP TO 32,000 kg(force)/sq cm
D. B. Balashov 19 May 1971 22 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Zemlin (USSR), no. 2, 1971 p 24-32
(SC-T-713031) Avail: NTIS

The dislocation method of plunger-pistons in a piezometer was used to investigate the relative change of the volume of the following rock species: granite, basalt, gabbronorite, and dunite, under conditions of a quasi-hydrostatic pressure of 32,000 kg/sqcm. The isothermic volume compressibility was determined and the density was calculated for the investigated rock types. The data on the isothermic volume compressibility were compared with the corresponding data on static measurements found in literature. Author

N72-10321# Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
INFLUENCE OF SHORT-TERM ACTIVITY RELEASES INTO THE ATMOSPHERE ON THE ANNUAL RADIATION BURDEN IN THE ENVIRONMENT OF NUCLEAR POWER PLANTS [EINFLUSS VON KURZZEITIGEN AKTIVITAETSABGABEN IN DIE ATMOSPHAERE AUF DIE JAEHRLICHE STRAHLUNGSBELASTUNG IN DER UMGEBUNG VON KERNKRAFTWERKEN]
H. Eichhorn May 1970 21 p refs In GERMAN; ENGLISH summary
(SZS-14/70) Avail: NTIS

An evaluation of the influence of short-term radioactive releases on the radiation burden in the environment of nuclear power plants was made by calculating the meteorological distribution conditions for a certain site. As an example, a maximum release of a five-day limit during 10 hours was investigated. It was concluded that in the case of total exploitation of the atmospheric dilution, maximum releases may always lead to an exceeding of the permissible annual radiation burden when in the environment of a nuclear power plant areas of maximum annual radiation burden are concerned.
Author (NSA)

N72-10322# Sandia Labs., Albuquerque, N.Mex.
COMPRESSION OF POROUS QUARTZ BY STRONG SHOCK WAVES
R. F. Trunin, G. V. Simakov, and M. A. Poduretz 27 May 1971 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Zemli (USSR), no. 2, 1971 p 33-39 Sponsored by AEC
(SC-T-713032) Avail: NTIS

Experimental results were determined for the dynamic compressibility of varieties of quartz having different initial densities: 1.15; 1.35; 1.55; 1.75, and 2.2 g/cu cm, within a wide range of exerted pressures. The position of the experimental compression curves in the plane indicates that the shock waves transform the quartz into high-density modifications, such as coecite and stipoverite. The position of the curve of the phase equilibrium was estimated up to a pressure of 600 kb. Author

N72-10323# Oak Ridge National Lab., Tenn.
STUDY OF DISPLACEMENT OF RADIOACTIVE PEBBLES ON THE BRUCHE. PART 1: COMPARISON OF EXPERIMENTAL RESULTS WITH THOSE OBTAINED USING THE MEYER-PETER FORMULA
G. Courtois, M. Gasnier, M. Maire, and M. Scherrer [1971]

11 p refs Transl. into ENGLISH from Houille Blanche (France), v. 25, 1970 p 651-657 Sponsored by AEC
(ORNL-TR-2498-Pt-1) Avail: NTIS

A radioactive tracer experiment in a stream in the French Vosges showed a sediment transport of 1730 t in 3 floods spread over 2 months. From the experimental data, the same value was calculated by the Meyer-Peter formula. The two results did not agree; assuming the critical flow at the beginning of the entrainment equal in the two cases, the Meyer-Peter formula gave a 20-fold higher transport than that found with the tracer method; if it is assumed that the transports were equal, the critical flow at the beginning of the entrainment was twice as high as was observed. The incompatibility of results is discussed. Author

N72-10324# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany). Abteilung fuer Fernmeldewesen.
PROPAGATION EFFECTS ON MONITORING ATMOSPHERIC FINE STRUCTURE USING SIDE-SCATTER ON APPROPRIATE FREQUENCIES
H. J. Albrecht 7 Jun. 1971 19 p refs Presented at the 17th EPP/AGARD Symp. on Propagation Limitations in Remote Sensing, Colorado Springs, Jun. 1971 Sponsored by Min. of Defence
(Rept-4-71) Avail: NTIS

The extension of atmospheric side-scatter analysis to higher frequencies in the optical range is discussed. This technique enables the size of smaller particles, such as air pollutants, as well as atmospheric mixing, to be monitored. Propagation effects of side-scatter systems above cities are described, and a laser transmitter with a number of side-scatter receivers is proposed as an effective monitoring system. ESRO

N72-10325# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron and Plasma Physics.
PROBLEMS RELATED TO HIGH-LATITUDE ELECTRIC FIELDS AND CURRENTS
C.-G. Faelthammar and L. P. Block May 1971 25 p refs Presented at the ESRO Colloq. on Wave Particle Interactions in the Magnetosphere, Orleans, France, 17-19 Mar. 1971 Submitted for publication
(TRITA-EPP-71-05) Avail: NTIS

A survey is presented of experimental results and coordinated studies, partly of laboratory experiments and partly of satellite observations, on the electrodynamics of the low-density plasma above the ionosphere. It is concluded that similarities exist between space phenomena and their counterparts in the laboratory, especially regarding sheath formation and the associated wave-particle interactions. ESRO

N72-10326# Royal Inst. of Tech., Stockholm (Sweden). Div. of Plasma Physics.
COSMIC GEOPHYSICS. CHAPTER 8: TOPOLOGY, FIELDS, AND PLASMA FLOW OF THE MAGNETOSPHERE
Lars P. Block Jul. 1971 60 p refs Revised
(Rept-70-24) Avail: NTIS

The configuration of the magnetosphere is described in terms of the magnetic field. The interaction between ionospheric and magnetospheric plasma is analyzed. Finally, laboratory simulation of magnetospheric phenomena is discussed. ESRO

N72-10327# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly bulletin, Aug. 1970 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, AOUT 1970]
Aug. 1971 28 p In FRENCH and DUTCH
Avail: NTIS

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during August 1970 are tabulated. ESRO

N72-10328# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Feb. 1971 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, FEVRIER 1971]
Feb. 1971 31 p in FRENCH and DUTCH
Avail: NTIS

Results of ionospheric and cosmic ray (neutron component) daily observations at Dourbes (Belgium) are tabulated for February 1971. ESRO

N72-10329# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly bulletin, Mar. 1971 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, MARS 1971]
Mar. 1971 31 p In FRENCH and DUTCH
Avail: NTIS

Results of ionospheric and cosmic ray (neutron component) daily observations at Dourbes (Belgium) are tabulated for March 1971. ESRO

N72-10330# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION: SMOKE AND SULFUR DIOXIDE Monthly bulletin, Jan. 1971 [POLLUTION ATOMOSPHERIQUE, FUMEE ET ANHYDRIDE SULFUREUX BULLETIN MENSUEL, JANVIER 1971]
Jan. 1971 28 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS

Data obtained at Belgian weather stations in January 1971 are tabulated. The air pollution apparatus is briefly described. ESRO

N72-10331# Naval Weapons Lab., Dahlgren, Va. Warfare Analysis Dept.
REFINED GEODETIC RESULTS BASED ON DOPPLER SATELLITE OBSERVATIONS
Richard J. Anderle Aug. 1971 47 p refs Presented at the AAS/AIAA Astrodyn. Specialists Conf. 1971, Ft. Lauderdale, Fla., 17-19 Aug. 1971
(AD-728017; NWL-TR-2889) Avail: NTIS CSCL 08/5

Locations of Doppler satellite observing stations have been recomputed to determine a set which is more self-consistent and more consistent with the CIO pole. The motion of the earth's pole computed on the basis of these coordinates agrees with the astronomical determinations to about one meter, while the coordinates of individual stations determined on the basis of five days of observations of one satellite show a consistency of about two meters. Solutions for the positions of a station based on two satellite passes observed within a few hours were found to be accurate to about ten meters. Author (GRA)

N72-10332# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE KFA (DEPARTMENT OF THE ATMOSPHERIC PHYSICS) AERIAL EXPEDITIONS 1 AND 2 FOR STUDY OF THE PECULIARITIES OF CONDITIONS OF THE BOUNDARY LAYER OF THE ATMOSPHERE OVER AN OASIS AND A SEMIARID REGION
Yu. V. Petrov 19 Mar. 1971 6 p Transl. into ENGLISH from Tr. Tashkent Univ. Nauch. (USSR) no. 349, 1969 p 119-120
(Project AF PROJ. 682(E))
(AD-727535; FTD-HT-23-84-71; UR-0000-69-000-349) Avail: NTIS CSCL 04/1

An expedition was conducted during the periods 25 June through 23 July 1966 and 16-31 May 1967 by the Department of Physics of the Atmosphere of Tashkent University. The flights were made by a YaK-12M aircraft equipped with a meteorograph and other instruments from the Sergeli airport in the neighborhood of Chardara village at an altitude of 0.9-1.0 km in the standard atmosphere. Flights were made over the semiarid region at altitudes up to 2.5-3.0 km. The spatial distribution of zones of increased aircraft turbulence was determined; the maximum was at altitudes of 0.5-1.0 km. In this layer the accelerations attained 0.45 G in spring and 0.7 G in summer. Author (GRA)

N72-10333# Purdue Univ., Lafayette, Ind. School of Chemical Engineering.

DISPERSION IN HETEROGENEOUS NONUNIFORM ANISOTROPIC POROUS MEDIA

Robert A. Greenkorn Sep. 1970 97 p refs
(Grant EPA-16060-DLL)
(PB-200258; Rept-1606-DLL-09/70) Avail: NTIS CSCL 20D

The theory and measurement of dispersion during miscible flow in heterogeneous nonuniform anisotropic porous media is studied. The continuum and statistical theories of flow in porous media were studied. A series of experiments in models of unconsolidated porous media were run to study the effects of heterogeneity, nonuniformity, and anisotropy on dispersion. The results have immediate practical applicates, especially in tracing of contaminents in surface and subsurface flow such as movement of pesticides, fertilizers, acid mine drainage, feed-lot waste, ect. through the soil. Author (GRA)

N72-10334# American Inst. of Crop Ecology, Silver Spring, Md.

AICE SURVEY OF USSR AIR POLLUTION LITERATURE. VOLUME 7: MEASUREMENTS OF DISPERSAL AND CONCENTRATION, IDENTIFICATION, AND SANITARY EVALUATION OF VARIOUS AIR POLLUTANTS, WITH SPECIAL REFERENCE TO THE ENVIRONS OF ELECTRIC POWER PLANTS AND FERROUS METALLURGICAL PLANTS

M. Y. Nuttonson Jan. 1971 112 p refs
(Grant AP-00786)
(PB-200996; APTD-0686) Avail: NTIS CSCL 13B

A survey on the distribution and measurement of dispersal and concentrations of aerosols in the atmosphere around Karasnoyarsk, U.S.S.R. is presented. Data cover methods of determination, sources of pollution paying particular attention to electric power plant and ferrous metallurgical plant emissions. Also included is the use of helicopters for hygienic study of air pollution dynamics. E.H.W.

N72-10335# Center for the Environment and Man, Inc., Hartford, Conn.

LONG-TERM EFFECTS OF AIR POLLUTION: A FIVE-YEAR RESEARCH PROGRAM

G. D. Robinson May 1971 37 p ref
(Contract CPA-22-69-155)
(PB-200517; CEM-4029-438; APTD-0687) Avail: NTIS CSCL 13B

A program of research on long term problems of air pollution is outlined. The major problem areas are first identified, with no attempt at a formal definition of long term. Priorities are allocated to the problem areas. Research projects are then identified and tabulated. Classification is both according to the space scale of the phenomena involved and according to the nature of the technique of the recommended attack. The space scales are divided into local, regional, continental, and global. Priorities allocated to the projects by application of the criteria are tabulated. An overall rate of expenditure is proposed and a timetable for work on some major projects is suggested. GRA

N72-10336# Naval Postgraduate School, Monterey, Calif.

A COMPARISON OF OCEANIC PARAMETERS DURING THE OCEANIC PERIOD OFF THE CENTRAL COAST OF CALIFORNIA M.S. Thesis

Elroy Anthony Soluri Mar. 1971 363 p refs
(AD-727137) Avail: NTIS CSCL 08/10

A detailed examination of the coastal region between Monterey Bay and San Francisco Bay was conducted from 1 to 6 November 1970. Measurements of temperature, salinity, sound velocity, beam transmittance, Coulter particle size distributions, chlorophyll a, phosphate, and oxygen were obtained at 86 stations from the surface to 100 meters. The data collected are presented in the form of contours in horizontal and vertical sections and depth profiles. Author (GRA)

N72-10337# Stanford Research Inst., Menlo Park, Calif.

CONSTITUTIVE RELATIONS FROM AN IN SITU LAGRANGIAN MEASUREMENT OF STRESS AND PARTICLE VELOCITY, PHASE 1 Interim Report

Douglas D. Keough Washington DASA 27 Jan. 1971 62 p refs
(Contract DASA01-70-C-0098; DASA Proj. NWER-SB-047)
(AD-728018; SRI-PYU-8567; DASA-2685) Avail: NTIS CSCL 08/11

The first phase of a program on in situ measurement of stress waves to obtain more realistic constitutive relations of rocks and soils is described. The equations of motion were transformed for calculating constitutive relations from stress and particle velocity data obtainable with Lagrangian gages in spherical waves. Calculated and exact specific volume-time profiles were compared for a decaying spherical shock wave as a test of the accuracy of specific volume-particle velocity relations determined with particle velocity gages in divergent waves. Ytterbium stress gage systems suitable for in situ measurements were tested on small-scale laboratory experiments. Gages recovered intact after shock loading to about 20 kbar indicated that the gage system was promising for use on large-scale field experiments. The absence of gage stretching signals in hemicylindrical and spherical flow experiments indicates that tangential stress is not transmitted to the gage element. Various existing and proposed particle velocity gage systems were examined for accuracy and for adaptability to in situ work. Mutual inductance and self-inductance and microwave reflection systems were examined. A proposed mutual inductance system appeared to be most suited to in situ experiments.
Author (GRA)

N72-10338# Woods Hole Oceanographic Institution, Mass.

MEDITERRANEAN SEA ATLAS OF TEMPERATURE, SALINITY, OXYGEN, PROFILES, AND DATA FROM CRUISES OF R. V. ATLANTIS AND R. V. CHAIN WITH DISTRIBUTION OF NUTRIENT CHEMICAL PROPERTIES

A. R. Miller, P. Tchernia (Museum Natl. d'Hist. Nat., Paris), H. Charnock (Southampton Univ.), and D. McGill (Coast Guard Acad.) Jul. 1970 219 p refs In ENGLISH and FRENCH *Its* Contrib. No. 2540
(Contract Nonr-2196(00))
(AD-727351; LC-Card-78-654040) Avail: NTIS; Woods Hole Oceanog. Inst., Woods Hole, Mass. $30.00 CSCL 08/10

It is the purpose of this Atlas to present a series of data consistent in techniques of acquisition, comprehensive in coverage, and representative of the environment during the period of strongest dynamical activity--the winter season. For the last objective the data are not altogether ideal, because one of the cruises, CHAIN 21, took place in October. Data from another, CHAIN 7, in June of 1959, are included to serve as contrast to the predominant winter conditions. The authors, recognizing the paucity of existing data in the Mediterranean during the winter season, have gathered and compiled these data with the hope that their presentation in one volume will serve as a useful background for many research purposes. Towards this end, much of the data are presented in profile form and in color, in order to relate visually one geographic area with another and to furnish perspective to the broad features of the Mediterranean environment. Author (GRA)

N72-10339# Texas A&M Univ., College Station. Dept. of Oceanography.

NUMERICAL MODELING OF RANDOMLY ROUGH SURFACES WITH APPLICATION TO SEA SURFACES

Jerald W. Caruthers and Jorge C. Novarini Jun. 1971 47 p refs

(Contract N00014-68-A-0308-0002)
(AD-726701; A/M-Ref-71-13-T) Avail: NTIS CSCL 08/3

A technique for generating numerical randomly rough surfaces having specific directional spectra has been developed through the extension of the theory of linear systems into two dimensions. Wind driven (sea) surfaces having Neumann direction spectra were modeled for wind speeds of 2.5, 5, 10, and 20 m/sec. These surfaces were tested through the normalized autocovariance functions and the variances. Over five decades of values, the individual variances for the modeled surfaces differed by no more than 20% from the theoretical values for the Neumann seas they modeled. The normalized autocovariance functions for the model surfaces were in agreement with the theoretical functions. The use of these surfaces in radiation scattering studies is discussed briefly. Author (GRA)

N72-10340# Texas Univ., Dallas.
SEISMIC TRAVEL TIME STUDY Final Report, 15 Jan. 1970 - 14 Apr. 1971
Anton L. Hales Mar. 1971 26 p refs
(Contract F19628-70-C-0176; ARPA Order 192; AF Proj. 5130)
(AD-727775; AFCRL-71-0291) Avail: NTIS CSCL 08/11

The report consists of an introduction in which is given a list of published papers on the travel times of body waves together with brief comments on the results. The main body of the report describes a new determination of the velocity distribution in the outer core. Earlier studies of the velocity distribution in the outer core have been based on the travel times of SKS. However, SKS arrivals can only be observed satisfactorily for arc distances at the surface greater than 83 degrees. This lower limit of observation of SKS corresponds to an arc distance of 40.2 degrees within the core. Thus the velocities in the outermost 250 km of the core are based upon an extrapolation. Author (GRA)

N72-10341# Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
GEOMORPHOLOGY OF THE EAST FLANK OF THE SPRING MOUNTAINS, NEVADA Final Report, 1 Dec. 1967 - 30 Jun. 1971
Laurence H. Lattman 15 Jun. 1971 96 p refs
(Contract F19628-68-C-0136; AF PROJ. 76287628)
(AD-727037; AFCRL-71-0326) Avail: NTIS CSCL 08/7

The eastern flank of the Spring Mountains, Nevada exhibits pedimented alluvial fans derived from canyons trenching the mountains. The alluvial and colluvial fill of the canyons is undergoing excavation which exhibit at least two major standstill periods. The periods of standstill evidenced by terraces in the canyons also resulted in pedimentation of the fan surfaces and the terraces can be traced onto the fans as partially preserved pediments. The bedrock of the Spring Mountains is dominantly carbonate and extensive calichification and case-hardening has developed on the alluvial and colluvial material in the canyons and on the fans. These cementation processes are extremely rapid, developing within one year. Color aerial photography, and to a lesser extent color IR photography, allows mapping of the fan surfaces and establishment of crude estimates of cementation. Author (GRA)

N72-10342# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
DEVELOPMENT OF A MERCURY TILTMETER FOR SEISMIC RECORDING Final Report, Jul. 1969 - Mar. 1970
Sheldon W. Buck, Frank Press, Dudley Shepard, M. Nafi Toksoz, and Henry Trantham, Jr. Mar. 1971 137 p
(Contract F44620-69-C-0126; ARPA Order-1484; AF PROJ. 9555)
(AD-726521; CSDL-R-655; AFOSR-71-1826TR) Avail: NTIS CSCL 08/11

A seismic tiltmeter has been designed in a joint effort between the Charles Stark Draper Laboratory Division of MIT and the MIT Department of Earth and Planetary Sciences. A pair of ninety-foot mercury pendulums were constructed and installed in a low noise site near Eilat, Israel. Author (GRA)

N72-10343# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RAPID METHODS FOR THE DETERMINATION OF NOXIOUS SUBSTANCES IN THE AIR
E. A. Peregud, E. V. Gernet, and M. S. Bykhovskaya 8 Apr. 1971 111 p refs Transl. into ENGLISH from the book "Bystrye Metody Opredeleniya Vrednykh Veshchestv v Vozdukhe" USSR, 1962 p 9-10, 17-41, 47-59, 62-70, 80-97, 182-186, 253-254
(FTD Proj. 60403)
(AD-726795; FTD-HC-23-1401-68; UR/0000-62-000-000) Avail: NTIS CSCL 13/2

The book is devoted to the description of rapid methods of determining a large number of substances encountered in the air, which have a toxic effect upon the human organism. The first part describes the sampling methods and the special equipment used in rapid methods of determining toxic substances in the air. Special attention is devoted to the question of measuring out the gases and methods of preparing mixtures of substances with air. The second part is devoted to a description of methods of determining the toxic substances most frequently encountered in the air. Author (GRA)

N72-10344# Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
ATMOSPHERE BOUNDARY OPTICS Final Report, 1 Nov. 1966 - 30 Jun. 1968
Albert W. Stohrer and Alan L. Cole Jun. 1971 21 p ref
(Contract N00014-67-A-0181-0003; ORA Proj. 084690)
(AD-726421; ORA-084690-1-F) Avail: NTIS CSCL 08/10

The study was conducted to determine the feasibility of detecting plankton over various sea states using absorption spectroscopy with visible light. A qualitative analysis of their presence and a quantitative analysis of their concentrations were to be determined. Over a limited range of 100 feet or slightly more, it appears that a white light source with a collimated light beam should have adequate sensitivity even in daylight. During darkness or with certain improvements, it should be possible to improve the range. The equipment was not field tested, so positive proof of plankton detection and concentration measurement was not obtainable. Author (GRA)

N72-10345# Oregon State Univ., Corvallis.
A COMPILATION OF OBSERVATIONS FROM MOORED CURRENT METERS AND THERMOGRAPHS. VOLUME 5: OREGON CONTINENTAL SHELF, 31 JULY - 21 SEPTEMBER 1969
A. Huyer, J. G. Pattullo, J. Bottero, and R. L. Smith Jun. 1971 48 p refs
(Contract N00014-67-A-0369-0007; Grant NSF GA-1435; NR Proj. 083-102)
(AD-726445; Data-46; Ref-71-1) Avail: NTIS CSCL 08/10

Observations from an instrument array moored over the continental shelf off Oregon from 31 July to 21 September 1969 are presented. Temperature, current and wind observations were obtained every 20 minutes. First order statistics, histograms, progressive vector diagrams and time series plots are presented. Supplementary wind observations at Newport are also described. It is recommended that wind observations be part of future coastal current observational programs and that thermographs be placed in positions with a large temperature gradient. Author (GRA)

N72-10346*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROPOSED TECHNIQUES FOR LAUNCHING INSTRUMENTED BALLOONS INTO TORNADOES
Frederick C. Grant Washington Nov. 1971 21 p refs
(NASA-TN-D-6503; L-7933) Avail: NTIS CSCL 04A

A method is proposed to introduce instrumented balloons into tornadoes by means of the radial pressure gradient, which supplies a buoyancy force driving to the center. Presented are analytical expressions, verified by computer calculations, which show the possibility of introducing instrumented balloons into tornadoes at or below the cloud base. The times required to reach the center are small enough that a large fraction of tornadoes are suitable for the technique. An experimental procedure is outlined in which a research airplane puts an instrumented, self-inflating balloon on the track ahead of the tornado. The uninflated balloon waits until the tornado closes to, typically, 750 meters; then it quickly inflates and spirals up and into the core, taking roughly 3 minutes. Since the drive to the center is automatically produced by the radial pressure gradient, a proper launch radius is the only guidance requirement. Author

N72-10347# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.

A DETERMINATION OF HEIGHT DIFFERENCES FROM GRAVITY AND GRAVITY GRADIENTS Final Report, Oct. 1968 - Apr. 1971

Rolland S. Hardy Apr. 1971 47 p refs
(Contract DAAK02-69-C-0285; FRI Proj. 782-s; PA Proj. 4A061102B52C)
(AD-727681; ERI-85500; ETL-CR-71-10) Avail: NTIS CSCL 08/5

Theoretical, hypothetical, and actual field data relationships, involving gravity and gravity gradients, were studied to determine potentially applicable field procedures for the determination of height differences of horizontally separated ground points. First it was confirmed that height differences by gravimetric methods are directly related to the knowledge of, or capability of determining, the free air gravity anomaly differences between points. It was then determined by a combination of model and real data analysis that horizontal gravity gradients are potentially more useful than vertical gravity gradients as a parameter in support of relative gravity intensity observations. Finally it was concluded that the most promising approach to field tests involving gravity and gravity gradients, would involve a few vertically controlled base stations at the ends of profiles, or surrounding the area to be surveyed, in combination with a 'roving' gravimeter (or gravimeters) operating along the profile or inside the area. Gravity and horizontal gravity gradients would be observed at the base stations and at the roving stations to provide a good estimate of anomaly differences in a sparsely controlled gravity environment. Author (GRA)

N72-10348# Kansas Univ., Lawrence. Dept. of Geography.

THREE DIMENSIONAL MAPS Final Report

George F. Jenks and Theodore R. Steinke May 1971 23 p refs
(Contract Nonr-583(15); NR Proj. 389-146)
(AD-724799) Avail: NTIS CSCL 08/2

The report on Three Dimensional Maps is broken into three distinct parts. The first is a summary of the accomplishments of the research including a listing of technical reports, a bibliography of related studies published, and a listing of students who were benefited in some manner by working on the project. The second section contains new information relating to the aesthetics of 3-D mapping and the final section provides some words of caution on the use of this technique. Author (GRA)

N72-10349# Naval Oceanographic Office, Washington, D.C.

THE AUTOMATED SYSTEM FOR THE INVESTIGATION OF PHYSICAL FIELDS OF THE OCEAN [AVTOMATIZIROVANNAYA SISTEMA DLYA ISSLEDOVANIYA FIZICHESKIKH POLEI OKEANA]

V. P. Dmitruk, ed. 1971 25 p Transl. into ENGLISH from Tr. Akad. Nauk Ukr. SSR, Morsk. Hidrofizychnyi Inst. (Kiev), 1970 p 3-20
(AD-724756; NOO-Trans-542) Avail: NTIS CSCL 08/10

The study of the World Ocean for the purpose of utilization of its energy, food, and mineral resources has been accompanied by an ebulient expansion of the scale of the marine investigations. Their effectiveness is determined first of all by the apparatus and equipment which they utilize. During the last ten years, the equipment used in oceanographic investigations was basically changed by implementation of the newest technological, radioelectronic and computer means. The Marine Hydrophysical Institute of the Uk. SSR Academy of Sciences (MHI) brought about this renewal in an orderly consecutive fashion. Author (GRA)

N72-10350# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

SATELLITE DATA ANALYSIS TO INVESTIGATE THE HORIZONTAL ION DENSITY GRADIENTS IN THE LOWER ATMOSPHERE Final Technical Report, 1 May 1970 - 31 May 1971

Gerald W. Sharp, Kent K. Harris, R. D. Sharp, W. C. Knudsen, and Richard G. Johnson May 1971 86 p refs
(Contract N00014-70-C-0324; ARPA Order 215)
(AD-724775; LMSC/D177361) Avail: NTIS CSCL 04/1

The final report is on the analysis of the data obtained from a satellite measurement program to investigate the characteristics and causes of horizontal ion density gradients in the F-region ionosphere. Data from the orbits prior to 225 of the OVI-18 satellite are analyzed here. The OVI-18 satellite was launched on 18 March 1969 into a polar orbit with apogee at 590 km and perigee at 469 km. Although the vehicle failed to achieve its desired earth-orientation, much valuable ion, electron and energetic particle data were obtained. Many gradients were observed in the ion density, some of which correlated with energetic particle precipitation in the auroral zones. It is concluded that precipitated particles in the night auroral zones give rise to significant ionization gradients at low altitudes and that these effects, although reduced in magnitude, are also seen at altitudes near 500 km, well above the F2 peak in ionization. Author (GRA)

N72-10351# Technische Hochschule Carolo Wilhelmina, Brunswick (West Germany). Naturwissenschaftliche Fakultaet.

DETERMINATION OF THE ATMOSPHERIC EXCHANGE COEFFICIENTS BETWEEN 0 AND 15 M ALTITUDE FROM TEMPERATURE AND NATURAL RADIOACTIVITY CONCENTRATION MEASUREMENTS Ph.D. Thesis **[BESTIMMUNG DES AUSTAUSCHKOEFFIZIENTEN IN DER ATMOSPHAERE IN EINER HOEHE VON 0 BIS 15 M AUS DEN MESSUNGEN DER TEMPERATUR UND DER KONZENTRATION DER NATUERLICHEN RADIOAKTIVITAET]**

Klaus Trippler 1969 88 p refs In GERMAN Sponsored by Fraunhofer Ges.
Avail: NTIS

Vertical temperature and natural beta radioactivity profiles were determined between 0 and 15 m. It was found that the concentration of radioactive particles was strongly dependent on wind velocity. Turbulent diffusion coefficients were determined and a linear relation was found with altitude so that measurement of beta activity of the air could be used as a measure of air turbulence. ESRO

N72-10352# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Meteorologie und Geophysik.

THE INACTIVATION OF FREEZING NUCLEI BY COAGULATION WITH AITKEN NUCLEI [UEBER DIE INAKTIVIERUNG VON GEFRIERKERNEN DURCH KOAGULATION MIT AITKENKERNEN]

H.-W. Georgii and R. S. Keller Jul. 1970 60 p refs In GERMAN; ENGLISH summary *Its* Ber. des Inst. fuer Meteorol. und Geophys. Nr. 21
Avail: NTIS

The deactivation process presupposes a hypothetical mechanism, by which the surface of freezing nuclei is covered by inactive Aitken nuclei (particles with a radius smaller than 0.1 micrometer). The time for inactivation is calculated under the suppositions that the Aitken nuclei coverage is a monomolecular layer and that Aitken nuclei consumed by the coagulation process are replaced by continuous production. The calculations show that the time necessary for inactivation is large for various sizes of coagulating particles, in spite of the high coagulation rate. If the Aitken nuclei approach the size of the freezing nuclei, total coverage of the surface is rapidly reached. Three criteria are given to determine the optimal atmospheric model. The calculations show that the deactivation process is oply effective in a polluted atmosphere, when the number of Aitken nuclei is above a million/cc. ESRO

N72-10353# Ohio State Univ., Columbus. Dept. of Geodetic Science.

THE FORMATION AND EVALUATION OF DETAILED GEOPOTENTIAL MODELS BASED ON POINT MASSES

Paul E. Needham Dec. 1970 186 p refs
(Contract F19628-69-C-0127; AF Proj. 7600)
(AD-725060; DGS-149; AFCRL-70-0718; SR-12; Task-760002) Avail: NTIS CSCL 08/5

Detailed models of the geopotential defined in a geocentric coordinate system must currently be based on a combination of satellite derived data and terrestrial gravity observations. This investigation concerns the use of such data to develop a geopotential model consisting of a spherical harmonic series supplemented by point masses of defined magnitude and position. An undulating reference equipotential surface described by a 14th degree and order set of spherical harmonic potential coefficients is established and conventional terrestrial gravity anomalies are redefined to refer to this surface. These anomalies are used to determine mass magnitudes for point mass arrays positioned to approximate Green's equivalent layers. The technique is demonstrated by developing a geopotential model for the central third of the United States that is approximately equivalent to a model expressed in spherical harmonic coefficients to 180th degree and order. A much more detailed model is also developed for a more limited area. Extensive comparisons are made between geopotential functions computed from these models and comparison standards derived through classical geodetic procedures. The results of this study show that a complex and accurate model of the geopotential can be developed using the described techniques. The method would be most useful in situations requiring repetitive computations of geopotential functions in limited areas. Author (GRA)

N72-10354# TRW Systems Group, Redondo Beach, Calif. Applied Mechanics Lab.

HOLOGRAPHIC STUDY OF WAVE PROPAGATION IN GRANITE Final Report, 4 Jun. 1969 - 31 Dec. 1970

Robert Aprahamian, Jerold J. Jacoby, John D. OKeefe, and Thomas J. Ahrens Washington, D. C. DASA 21 May 1971 132 p refs
(Contract DASA01-69-C-0152; ARPA Order 1468; Proj. 9F10)
(AD-725159; DASA-2608; TRW-70-4341/386) Avail: NTIS CSCL 08/7

Three techniques of holographic interferometry were developed to study the repsonse of geological materials to propagating stress waves. Two of these techniques, stored-beam interferometry and double-exposure interferometry, were found effective when applied to studying small-amplitude wave propagation. The third technique, a form of time-average holographic interferometry, which produced fringes relating to velocities, was employed when studying higher stress levels (up to 30 kb). Low amplitude stress waves were generated by pendulum impacts; a gas gun was used to obtain higher stress levels. A complete description of each technique is given herein, together with a comparison of experimental results (using Westerly granite) and theoretical predictions. Author (GRA)

N72-10355# AeroChem Research Labs., Inc., Princeton, N.J.

STUDY OF MASS SPECTROMETRIC ION SAMPLING PROCESSES Final Report, 7 Apr. 1967 - 6 Jul. 1970

Rudolf R. Burke and William J. Miller Sep. 1970 78 p refs
(Contract F19628-67-C-0325; Proj.5710)
(AD-725149; AEROCHEM-TP-247; AFCRL-70-0550) Avail: NTIS CSCL 04/1

Ion sampling experiments were undertaken to determine the nature and magnitude of the problems inherent in mass spectrometric rocket probing of the D region. Mass spectrometric techniques were used to analyze the positive and negative ions sampled with an inlet system with variable geometry. The basic sampling system is a conical probe designed to attach the shock, allowing direct and undisturbed sampling of ambient ions from the supersonic stream. Profiles of the ion composition can be taken in the supersonic gas stream ahead of the shock wave and through the subsonic gas stream behind the bow shock (stationary shock layer technique). The ion sampling experiments have ascertained the effects of the shock and electric fields, which result in the fragmentation of cluster ions present in the supersonic stream and thereby alter the ion composition in the post-shock region. The decomposition kinetics of proton and $NO_3(-)$ hydrate ions $H(-)(H_2O)_n$ and $NO_3(-)(H_2O)_n$ were investigated and the rate constants for these decomposition reactions were determined. The importance of vibrational excitation in the decomposition reactions of hydrated protons was demonstrated. The present work indicates that the results from rocket-borne mass spectrometers are distorted by shock-induced and electric field-induced fragmentation. Author (GRA)

N72-10356# Aerospace Corp., El Segundo, Calif. Lab. Operations.

SYMPOSIUM ON THE UPPER ATMOSPHERE: RESULTS AND INTERPRETATION OF OV1-15 DATA Technical Report, 11 Jul. 1968 - 26 Aug. 1970

Fred A. Morse, comp. 28 May 1971 189 p refs Held at Los Angeles
(Contract F04701-70-C-0059)
(AD-725033; SAMSO-TR-71-104; TR-0059(6260-10)-6) Avail: NTIS CSCL 04/1

Papers presented at the Symposium on the Upper Atmosphere: Results and Interpretation of OV1-15 Data that was held on 26 August 1970 by the Space Physics Laboratory of The Aerospace Corporation are compiled in this document. This symposium summarized the results of the measurement program carried out by experiments of The Aerospace Corporation aboard the USAF/Aerospace/AFCRL satellite OV1-15 (1968-59A). The OV1-15 satellite, which was called the Solar Perturbation of Atmospheric Density Experiments Satellite (SPADES), contained a group of complementary experiments designed to study the response of the upper atmosphere to solar and magnetospheric disturbances. As the result of these experiments on OV1-15, the first comprehensive, long-term measurements of the upper atmosphere at altitudes below 250 km were made. Author (GRA)

N72-10357*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYTICAL SOLUTION FOR THE WIND-DRIVEN CIRCULATION IN A LAKE CONTAINING AN ISLAND

Marvin E. Goldstein and Richard T. Gedney Washington Nov. 1971 78 p refs
(NASA-TN-D-6541; E-6335) Avail: NTIS CSCL 04B

An analysis was carried out to determine analytically the effect of an island on the wind driven currents in a shallow lake (or sea). A general analysis is developed that can be applied to a large class of lake and island geometries and bottom topographies. Detailed numerical results are obtained for a circular island located eccentrically or concentrically in a circular lake with a logarithmic bottom topography. It is shown that an island can produce volume flow (vertically integrated velocities) gyres that are completely different from those produced by a normal basin without an island. These gyres in the neighborhood of the island will produce different velocity patterns, which include the acceleration of flow near the island shore. Author

N72-10358# New Mexico Univ., Albuquerque. Dept. of Physics and Astronomy.

ATMOSPHERIC OZONE Final Report, 1 Jan. 1969 - 31 Dec. 1970

Victor H. Regener 14 Apr. 1971 31 p refs
(Contract F19628-69-C-0138; AF Proj. 8604)
(AD-725764; AFCRL-71-0230; Task-860406) Avail: NTIS CSCL 04/1

The Final Report contains a paper entitled On the Flux of Atmospheric Ozone Near the Ground by Victor H. Regener, as well as a report on further measurements of this flux by means of a wind tunnel placed on the ground. Author (GRA)

N72-10359# California Inst. of Tech., Pasadena. Seismological Lab.
SEISMIC PHENOMENA CONNECTED WITH EARTHQUAKES AND EXPLOSIONS Annual Report, 1 Nov. 1969 - 31 Oct. 1970
Don L. Anderson 1 Apr. 1971 38 p refs
(Contract F44620-69-C-0067; Proj. 8652)
(AD-725759; AFOSR-71-1856TR) Avail: NTIS CSCL 08/11

Considerable progress has been made in the detailed study of continental structure using a variety of approaches, some of which are new, and the results of theoretical progress in wave propagation theory. The author has regionalized continents into provinces having typical crust and mantle structure, as well as other distinctive geophysical and geologic properties, and has provided at least a preliminary description of these properties. More detailed investigations of the variation of properties within these provinces were also pursued. Use of this knowledge for prediction of the seismic field provided interpretations of the radiation field which led to the resolution of important source characteristics and physical parameters. The theory of inversion has been developed to the point of wide application and utility and besides its intrinsic importance in all areas of geophysics and science, its application to seismic source and structure studies provides a systematic means of determining physical parameters of importance in the discrimination of seismic events. Progress in asymptotic wave propagation theory promises to provide sensitive high-resolution techniques capable of determining details of earth structure, in particular velocity gradients in the crust and mantle, and details of the source spectrum. Author (GRA)

N72-10360*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Aero-Astrodynamics Lab.
EXPERIMENTAL EVIDENCE IN SUPPORT OF JOULE HEATING ASSOCIATED WITH GEOMAGNETIC ACTIVITY
Leonard L. DeVries Washington Nov. 1971 37 p refs
(NASA-TN-D-6518; M-175) Avail: NTIS CSCL 08N

High resolution accelerometer measurements in the altitude region 140 to 300 km from a satellite in a near-polar orbit during a period of extremely high geomagnetic activity indicate that Joule heating is the primary source of energy for atmospheric heating associated with geomagnetic activity. This conclusion is supported by the following observational evidence: (1) There is an atmospheric response in the auroral zone which is nearly simultaneous with the onset of geomagnetic activity, with no significant response in the equatorial region until several hours later; (2) The maximum heating occurs at geographic locations near the maximum current of the auroral electrojet; and (3) There is evidence of atmospheric waves originating near the auroral zone at altitudes where Joule heating would be expected to occur. An analysis of atmospheric response time to this heat shows time delays are apparently independent of altitude but are strongly dependent upon geomagnetic latitude. Author

N72-10361# Bay Area Air Pollution Control District, San Francisco, Calif.
REGIONAL AIRPORT SYSTEMS STUDY. ENVIRONMENTAL STUDIES: AVIATION EFFECT ON AIR QUALITY IN THE BAY REGION
Feb. 1971 169 p refs Sponsored in part by Dept. of Housing and Urban Develop.
Avail: NTIS

The results of a study of air contaminants associated with aircraft operations in the San Francisco Bay area are presented. Oxidant, carbon monoxide, sulfur dioxide, particulate matter, and nitrogen dioxide contaminants from aircraft engine emissions at public and military airports are covered as well as fuel handling, jet fuel dumping, and ground vehicle emissions. Region-wide and local climatological features are discussed including inversion climatology, airflow regimes, and temperature and precipitation distributions. The impact of aviation activities on air quality at four airports (San Francisco, Oakland, Oakland-North, and San Jose) is discussed utilizing a hybrid diffusion model. J.M.

N72-10362# Michigan Office of Planning Coordination, Lansing.
ENVIRONMENTAL QUALITY IN MICHIGAN, 1970
Jan. 1971 190 p refs
(HUD Proj. Michigan P-301)
(PB-201124; TR-D-2a) Avail: NTIS CSCL 13B

Second annual report of the advisory council for environmental quality, membership, noise pollution report, solid waste management report, motor vehicle abandonment, land use planning report, environmental education in Michigan report, air pollution report, water management problems and recommendations, organization of environmental functions. GRA

N72-10363 National Lending Library for Science and Technology, Boston Spa (England).
SIMPLE APPROXIMATION FORMULAE FOR DETERMINING THE CONCENTRATION DISTRIBUTION OF HIGH SOURCES
D. Yordanov 19 Aug. 1971 13 p refs Transl. into ENGLISH Bulg. Acad. of Sci., Geophys. Inst., Sofia, report
(NLL-CE-Trans-5555-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Vertical diffusion in the planetary boundary layer is investigated as a solution of the semiempirical equation of diffusion. Blackadar's statement is adopted for the exchange coefficient for adiabatic layers, that of Zilitinkevitsch-Tschalikov for unstable stratification and Tschalikov's for stable conditions. Simple approximation formulas are proposed for the determination of the concentration to leeward of a line source and of a point source; some comparisons are made with the data of Pasquill and those of Singer and Smith. Author

N72-10364 California Univ., Los Angeles.
THE STABILITY OF A BAROCLINIC LAYER WITH PLANETARY VORTICITY GRADIENT Ph.D. Thesis
Chung-Muh Tang 1970 79 p
Avail: Univ. Microfilms Order No. 70-19903

In order to solve the baroclinic Eady's stability problem with planetary vorticity gradient, a set of the linearized quasi-geostrophic equations was manipulated to yield a second-order confluent hypergeometric equation (Kummer's equation) with first-order homogeneous two point boundary conditions. A simple analytical method was developed to yield the instability property of the short waves and to yield a continuous spectrum of long neutral waves in the stability diagram. C.C. Lin's perturbation analysis was used to show the existence of long unstable waves near the first neutral curve in the stability diagram. The structures of the waves were investigated. The distinction between the structures of the short unstable waves and those of the long unstable waves was interpreted in terms of energetic processes. Dissert. Abstr.

N72-10365 California Univ., Los Angeles.
DETERMINATION OF SOME OPTICAL PROPERTIES OF THE EARTH'S ATMOSPHERE BY INVERSION OF SCATTERED RADIATION MEASUREMENTS Ph.D. Thesis
Kevin Dit Kwan Pang 1970 223 p
Avail: Univ. Microfilms Order No. 70-19878

Using a rotating-analyzer type photoelectric polarimeter the intensity and plane of polarization of the sky-light were measured in four narrow wavelength intervals centered at wavelength = 3430, 3975, 5235 and 6190 A. From the intensity maxima and minima and the plane of polarization the Stokes parameters were determined. Scanning of the sky was made in as many as 12 azimuths. The measurements were interpolated to obtain simultaneous values. Harmonic analysis of values along the same horizontal circle was made to obtain sinusoidal series representation of the variation with respect to azimuth. The analysis showed the existence of coefficients of orders higher than second in horizontal circles near the solar almucantar. Certain relations between coefficients of the same order, which hold for radiation emerging from a pure Rayleigh atmosphere, were found to be not well satisfied by the coefficients derived from the data. Dissert. Abstr.

N72-10366 New York Univ., N.Y.
A STUDY OF TRANSIENT TROPOSPHERIC PLANETARY-SCALE WAVES REPRESENTED BY SURFACE SPHERICAL HARMONICS Ph.D. Thesis
Yeong-jer Lin 1969 104 p
Avail: Univ. Microfilms Order No. 70-9782

Employing a modified equivalent-barotropic spectral model, a series of numerical integrations were studied using observed hemispheric data as initial conditions to obtain a better understanding of the dynamical behavior of transient large-scale flow patterns. The relevance and significance of each term in the dynamical equations were considered, using the numerical results obtained from four models. It is shown that the barotropic interactions have some influence on the dynamics of large-scale transient wave motions, but less than for medium-scale waves. For transient planetary-scale waves, the barotropic divergence term is of importance and has the greatest effect on the movement of the broadest-scale waves. The vector correlation analyses are used to show the degree to which the four models considered in this study successfully predict the fluctuations of planetary-scale flow patterns in particular. Dissert. Abstr.

N72-10367 Stanford Univ., Calif.
REMOTE SENSING OF THE ATMOSPHERE BY OCCULTATION SATELLITES Ph.D. Thesis
Jose Carlos Pomalaza-Diaz 1970 112 p
Avail: Univ. Microfilms Order No. 70-18457

Information about the pressure and temperature profiles of the lower atmosphere is contained in the phase retardation suffered by electromagnetic waves propagating between coorbiting satellites separated by approximately 8000 km. For microwaves, the droplets of clouds produce negligible effects but, in the region below the 360 mB level, the atmospheric water vapor contribution to the total phase retardation is important. When the water vapor contribution is subtracted, six satellites, with separations selected so that microwaves propagate at five different levels, are sufficient to define the atmosphere in the region below 18 km. A least mean square iterative procedure can be used to infer the pressure and temperature parameters from the phase retardation data. It concluded that, with six satellites and with accuracies of about 0.3 m and 0.5 dB for the phase and attenuation measurements, it is possible to define the pressure and temperature profiles with less than 3 mB and about 2 deg K accuracies, respectively, in the atmospheric region between the 70 and 780 mB levels. Dissert. Abstr.

N72-10854*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.
DYNAMIC UPPER ATMOSPHERIC FORCE MODEL ON STABILIZED VEHICLES FOR A HIGH-PRECISION TRAJECTORY COMPUTER PROGRAM
A. R. Khatib *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 125-132 refs (See N72-10841 01-30)
Avail: NTIS CSCL 04A

N72-10869*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M405: TRI-AXIS FLUX GATE MAGNETOMETER
William D. Womack *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 153-168 ref (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 08M

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N72-10368# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
DEVELOPMENT OF A SIGNAL PROCESSING SYSTEM APPLICABLE IN NUCLEAR SPECTROMETRY Ph.D. Thesis - Grenoble Univ., France [ETUDE ET REALISATION D'UN PROCEDE DE TRAITEMENT DU SIGNAL APPLICABLE EN SPECTROMETRIE NUCLEAIRE]
Jean Lacorre Jan. 1971 87 p refs In FRENCH
(CEA-R-4038) Avail: AEC Depository Libraries

Various sources of noise present in the charge preamplifier and in the semiconductor detector are studied. Both the physical processes responsible for the noise and their localization are analyzed. The behavior of the field effect transistor constituting the preamplifier input is studied as a function of temperature. A theoretical study is made of a system for processing the signal produced by a gamma spectrometry chain. The processing is of the type integral of T from zero P(t)...dt in which P(t) is a qualified weighting function deduced from the theoretical weighting function, giving the optimum processing from the point of view of the minimum quadratic error criterion. The degradation of the signal to noise ratio is studied as a function of the degree of quantification. The effect of time dispersion on the time of departure of the analysis is studied, and the theory is verified by experimental measurements. Author (NSA)

N72-10369# Atomic Energy Establishment, Cairo (Egypt). Reactor and Neutron Physics Dept.
CALIBRATION OF A THREE CRYSTAL NaI PAIR SPECTROMETER
H. M. Abu-Zeid and A. M. Hassan 1970 24 p refs
(UARAEE-93) Avail: AEC Depository Libraries

The scintillation-pair-spectrometer is intended to yield energies and intensities of neutron capture gamma rays as precisely as possible. It is found possible to determine experimentally the relative peak-to-total ratio for a pair crystal spectrometer. Author (NSA)

N72-10370# Atomic Energy Establishment, Cairo (Egypt). Reactor and Neutron Physics Dept.
CONSTRUCTION OF A THREE CRYSTAL SCINTILLATION PAIR SPECTROMETER
A. M. Hassan and H. M. Abu-Zeid 1970 37 p refs
(UARAEE-100) Avail: AEC Depository Libraries

The construction and tests of a three-crystal scintillation pair spectrometer are reported. The design and construction of the radiation shield and collimation of the thermal neutron beam are also described. It is found that the intensity of the collimated thermal neutron beam at the target is 10 to the 6th power neutrons/sq cm sec. In the fast-slow coincidence circuit, the resolving time used for the fast is about 50 nanosec, while that of the slow is 0.42 microsec. The fast-slow coincidence was checked using a Na-22 standard source which indicates that the electronic equipment is satisfactory for a three-crystal pair spectrometer. Also, the gamma ray spectrum following thermal neutron capture in natural lead is presented, as a check for the validity of the spectrometer. Author (NSA)

N72-10371# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.

A HODOSCOPE BASED ON SMALL PHOTOELECTRON MULTIPLIERS, FEU-85 [GODOSKOP NA MALOGABARITNYKH FOTOELEKTRONNYKH UMNOZHITELYAKH FEU-85]

A. A. Borisov, A. P. Bugorskii, and S. B. Nurushev 1970 17 p refs In RUSSIAN
(IFVE-SEF-70-17) Avail: AEC Depository Libraries

The hodoscope system based on small FEU-85 photomultipliers is described. The hodoscope characteristics were investigated. The possibility of constructing the hodoscope with operating cell dimensions of 3 mm for loading the particles up to 300,000 per 0.1 sec is discussed. Author (NSA)

N72-10372*# Lockheed-Georgia Co., Marietta.

SPACE RADIATION HAZARDS TO PROJECT SKYLAB PHOTOGRAPHIC FILM, PHASE 2 Final Report

C. W. Hill and C. F. Neville Oct. 1971 125 p refs
(Contract NAS8-26441)
(NASA-CR-61364; ER-11192) Avail: NTIS CSCL 14E

The results of a study of space radiation hazards to Project Skylab photographic film are presented. Radiation components include trapped protons, trapped electrons, bremsstrahlung, and galactic cosmic radiation. The shielding afforded by the Skylab cluster is taken into account with a 5000 volume element mathematical model. A preliminary survey of expected proton spectrometer data is reported. Author

N72-10373*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DEVELOPMENT OF SKYLAB ENVIRONMENTAL PROTECTION FOR PHOTOGRAPHIC FILM

W. C. Askew, W. A. Clarke, and C. A. Best 1 Sep. 1971 92 p refs
(NASA-TM-X-64614) Avail: NTIS CSCL 14E

The problems of providing adequate environmental protection for photographic film on three Skylab missions and the technical and management approach to resolving these problems are presented. The radiation, temperature, and humidity environments to which film will be exposed for up to 230 days in space and the effects of these environments on film are discussed. The report concludes with a definition of the design requirements for the Skylab film repository. Author

N72-10374*# Agnew Tech-Tran, Woodland Hills, Calif.

THE RIFMA LUNAR AUTOMATIC SPECTROMETRIC EQUIPMENT [LUNNAYA AUTOMATICHESKAYA SPEKTROMETRICHESKAYA APPARATURA RIFMA]

G. E. Kocharov, N. F. Borodulin, S. V. Viktorov, O. M. Voropaev, A. Yu. Dzevanovskaya, O. G. Ivanov, G. V. Kiryan, V. V. Petrov, and V. A. Sakulskiy Washington NASA Oct. 1971 23 p refs Transl. into ENGLISH from the book "Peredvizhnaya Laboratoriya na Lune Lunokhod-1" Moscow, Nauka Press, 1971 p 89-95 Prepared for JPL
(Contract NAS7-100)
(NASA-TT-F-14031) Avail: NTIS CSCL 14B

The use of the RIFMA instrument to measure chemical composition and provide a differential energy spectrum of X-ray radiation of soils is examined. The RIFM automatic spectrometric unit has successfully endured the launching, lunar landing, and the difficult conditions of lunar experiment. In the course of the experiments, it was proved that the equipment operates both during the moon rover stops, or when it is in motion. The table shows a summary of the results of the determination of the chemical composition of different regions of the lunar surface and the results obtained in the Sea of Rains. This data substantiates the general concept about the origin of regolith being the result of the crushing of the rocks, basically of basalt composition. Spectrometric features of RIFMA equipment also made it possible to obtain data on variations of intensities of solar galactic cosmic rays. E.M.C.

N72-10375*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

COMBUSTION PRODUCTS GENERATING AND METERING DEVICE Patent Application

Richard E. Wiberg and John A. Klisch, inventors (to NASA) Filed 28 May 1971 21 p
(NASA-Case-GSC-11095-1; US-Patent-Appl-SN-147940) Avail: NTIS CSCL 14B

An apparatus for generating combustion products at a predetermined fixed rate, mixing the combustion products with air to achieve a given concentration, and distributing the resultant mixture to an area or device to be tested is described. The apparatus is comprised of blowers, a holder for the combustion product generating materials (which burn at a predictable and controlled rate), a mixing plenum chamber, and a means for distributing the air combustion product mixture. NASA

N72-10376# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Teoreticheskoi i Eksperimental'noi Fiziki.

MAGNETIC SPECTROMETER OF MISSING MASSES

A. M. Blagorodov, V. N. Luzin, L. I. Murze, A. A. Panov, I. A. Radkevich, T. G. Smolyankina, V. V. Sokolovskii, Yu. F. Tomashchuk, and Yu. P. Shkurenko 1970 56 p refs In RUSSIAN; ENGLISH summary
(ITEF-808) Avail: AEC Depository Libraries

The structure and major characteristics of the magnetic missing-mass spectrometer are described. Two independent sets are used for measuring the angle and the momentum of secondary charged particles. The first set is optical spark chambers and the second is sonic spark chambers. The liquid H2 target of the spectrometer is surrounded by an optical heavy plate spark chamber; these chambers are able to register neutral pions and gamma quanta. The uncertainty in the spectrometer to the proton from the negative pion proton yields proton negative X reaction is plus or minus 12 Mev for optical chambers and plus or minus 16 Mev for sonic chambers. The experimental results of the spectrometer calibration with the proton line from the proton proton yields proton proton reaction are given. There is good agreement with the table value of proton mass. Author (NSA)

N72-10377*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

METHOD AND APPARATUS FOR DETERMINING THE CONTENTS OF CONTAINED GAS SAMPLES Patent Application

Alfred J. Hobbs and Benjamin Seidenberg, inventors (to NASA) Filed 12 Feb. 1971 13 p
(NASA-Case-GSC-10903-1; US-Patent-Appl-SN-114846) Avail: NTIS CSCL 14B

An apparatus for analyzing gas samples in containers is described which is comprised of a vacuum chamber, a sealable opening in the vacuum chamber for inserting a sample holder, a means to open the sample and release the contained gas, a pressure sensing means, and a means for analyzing the gas released by opening the sample. The apparatus is operated by placing a sample containing the gas to be analyzed on the sample holder, sealing and evacuating the chamber, taking a background gas analysis, opening the sample container to allow the gas contained therein to escape into the evacuated chamber and withdrawing the released gas to the analysis apparatus. NASA

N72-10378*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

RF SOURCE RESISTANCE METERS Patent Application

Ernest C. Oakley, inventor (to NASA) Filed 19 Feb. 1971 15 p
(Contract NAS7-100)
(NASA-Case-NPO-10734; US-Patent-Appl-SN-116790) Avail: NTIS CSCL 14B

Several embodiments of RF-source resistance measuring devices are disclosed. Common to all embodiments is the inclusion of at least one variable resistor and a peak readout meter. In one design, two ganged unloaded potentiometers are employed. Another design comprises an automatic nulling RF power bridge circuit with a variable, rather than a fixed, bridge reference resistance. A third comprises a calorimeter with a variable rather than a fixed resistor. Another design employs attenuator pads with variable resistors. NASA

N72-10379# Institute of Nuclear Research, Warsaw (Poland).
CALCULATED EFFICIENCIES OF SOME CYLINDRICAL AND WELL-TYPE GAMMA RAY SCINTILLATION DETECTORS
K. Pytel 1971 21 p refs
(INR-1264) Avail: AEC Depository Libraries

Calculations for disk and pillar sources were prepared using the Monte Carlo method on the GIER digital computer. Codes are available for various source-detector geometries. Author (NSA)

N72-10380# Chicago Univ., Ill. Enrico Fermi Inst.
ELECTRON MICROSCOPE STUDIES Technical Process Report, Apr. 1970 - May 1971
Albert V. Crewe May 1971 13 p refs
(Contract AT(11-1)-1721)
(COO-1721-46) Avail: NTIS

The visibility of single atoms in electron microscopy was studied, especially with respect to heavy atom markers in DNA, RNA and protein studies. Virus studies on the FD phase are continuing. Electron energy losses in various DNA bases were investigated. Radiation damage caused by the electron beam was studied. Applications of electron holography were considered. A display system utilizing magnetic tape storage of elastic and inelastic scattering data is also discussed. K.P.D.

N72-10381# Iowa State Univ. of Science and Technology, Ames.
SPECTROSCOPIC TEMPERATURE MEASUREMENTS OF FLAMES AND THEIR PHYSICAL SIGNIFICANCE Ph.D. Thesis
Isaac Reif Jun. 1971 86 p refs
(Contract W-7405-eng-82)
(IS-T-442) Avail: NTIS

An examination of the theoretical basis of spectroscopic temperature measurements of nonisothermal nonhomogeneous flames by the line reversal, emission-absorption, slope, and two-line methods, when self-absorption effects are negligible was undertaken. The results depend on measurement method, energy of the quantum states involved in the line-producing transition(s), the particular temperature gradient prevailing in the flame, and the concentration distribution of the thermometric species. The temperatures measured are a function of a parameter T dot sub E, which is related to the average value of the function e to the (-E/kT sub x) power over the optical path. The existence is proven of an isothermal temperature field for Fe-free atoms in a premixed nitrous oxide-acetylene flame burning on long-path, slot burner. This flame was used to assess the importance of accurate relative transition probabilities in precise temperature measurements and to determine a new set of these parameters for 43 Fe lines in the 3450-3950 A wavelength region. Author

N72-10382# Los Alamos Scientific Lab., N.Mex.
HYDROSTATIC PRESSURE APPARATUS FOR ELECTRICAL MEASUREMENTS UP TO 17 KILOBARS AT VERY LOW TEMPERATURE
G. Delplanque, G. Malfait, M. Rieux, and D. Jerome [1971] 16 p refs Transl. into ENGLISH from Rev. Phys. Appl. (France), v. 5, 1970 p 731-736 Sponsored by AEC
(LA-tr-71-45) Avail: NTIS

A pressure vessel cryostat is described for electrical resistivity and magnetic measurements under hydrostatic pressure up to 17 kilobars over a temperature range from 1.2 to 300 K. Either liquids (alcohols or isopentane) or gases (helium or argon) are used as the fluid medium. The apparatus was used to study metal-to-insulator transition in ytterbium alloys. F.O.S.

N72-10383# Landessternwarte auf dem Koenigstuhl, Heidelberg (West Germany).
COMPONENT TESTS OF AN INFRARED PHOTOMETER FOR THE BALLOON-BORNE TELESCOPE THISBE [UNTERSUCHUNGEN AN KOMPONENTEN EINES INFRAROT-PHOTOMETERS FUER DAS BALLONTELESKOP THISBE]
Wilfried Hoffmann, Dietrich Lemke, and Clemens Thum Bad Godesberg, West Ger. bundesmin. fuer Bildung und Wiss. Jun. 1971 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-71-31) Avail: NTIS; ZLDI Munich: 10,50 DM

The main components of a surface photometer for the measurement of night sky radiation in the infrared region with the balloon-borne telescope THISBE are examined. The final design of the photometer which uses PbS detectors was determined after climatic tests. ESRO

N72-10384# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
CONTRIBUTIONS TO HYBRID PROGRAM CONTROLLED GENERATION OF ELECTRONIC INDICATORS [BEITRAEGE ZUR HYBRIDEN PROGRAMMGESTEUERTEN ERZEUGUNG ELEKTRONISCHER ANZEIGEN]
Karl-Friedrich Kraiss and Karl Reinhard Kimmel Apr. 1969 43 p In GERMAN *Its* Anthropotech. Mitt. Nr. 5/69
Avail: NTIS

For the anthropometric investigation of electronic indicators a universal symbol generator was constructed to compose random displays on a cathode ray tube. The apparatus is hybrid in the sense that the symbol representation is analog, whereas the picture information is stored in a digital core memory. Construction details of the logic of the equipment are given. ESRO

N72-10385# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
EXPERIMENT EI-92. A SPECTROMETER WITH SEMICONDUCTORS FOR MEASURING PROTONS IN THE ENERGY RANGE 0.25 - 13.5 MeV ABOARD THE SATELLITE AZUR. PART 1: EXPERIMENTAL DESIGN [DAS EXPERIMENT EI-92. EIN SPEKTROMETER MIT HALBLEITERDETEKTOREN ZUR MESSUNG VON PROTONEN IM ENERGIEBEREICH 0,25 BIS 13,5 MEV MIT DEM SATELLITEN AZUR. TEIL 1: AUFBAU DES EXPERIMENTES]
Juergen Moritz Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jun. 1971 58 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-71-29-Pt-1) Avail: NTIS; ZLDI Munich: 12,20 DM

The experiment EI-92 was built for the research satellite GRS-A/Azur. Two solid state detectors measure the directional proton intensities in the energy range 0.25 - 13.5 MeV and alpha-particles with 2.0 - 6.4 MeV. Five pulse height discriminators and a coincidence logic establish 6 digital pulse channels for the energy ranges 0.25 - 12.5; 0.25 - 1.65 MeV; 0.5 - 1.65; 1.0 - 1.65 and 1.65 - 13.5 MeV for protons and 2.0 - 6.4 MeV for alphas. The scientific aim, the instrumentation, and the development of the experiment are described. Author (ESRO)

N72-10386# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
COMPARATIVE STUDY OF SEVERAL LIGHT DEFLECTORS USING ELECTROOPTIC CRYSTALS FOR DEFLECTING AND IMAGE IN ONLY ONE DIRECTION Final Report [ETUDE COMPAREE DES DIFFERENTS DEVIATEURS DE LUMIERE

EMPLOYANT DES CRISTAUX ELECTROOPTIQUES DESTINES A DEVIER UNE IMAGE SUIVANT UNE SEULE DIRECTION RAPPORT FINAL]
G. Hepner and M. Chartier 10 Dec. 1970 16 p In FRENCH
Sponsored by Delegation Gen. a la Rech. Sci. et Tech.
(LC-DR-1-70-180/1/R) Avail: NTIS

The design of a 64-position one-dimensional digital deflector is described. The deflection is done in six stages by prisms and polarization switches with transverse fields. Each switch is composed of two potassium dihydrogen phosphate crystals. ESRO

N72-10387# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
STUDY OF THREE-DIMENSIONAL OPTICAL DATA STORAGE DEVICES USING HOLOGRAPHY [ETUDE DES MEMOIRES OPTIQUES TRIDIMENSIONNELLES UTILISANT LES PROPRIETES DE L'HOLOGRAPHIE]
E. Spitz and G. Bismuth 19 Nov. 1970 107 p refs In FRENCH Sponsored by Direc. de Rech. et Moyens d'Essai
(LCR-70-171/1/R; DRME-64-34-479) Avail: NTIS

The storage of optical data is considered, including storage in thick media and superimposition of holograms. The use of different recording media such as silver emulsion, bleached emulsion, gelatins, photochroms, and ferroelectric crystals is discussed. ESRO

N72-10388# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
RESULTS OBTAINED WITH A PROTOTYPE APPARATUS FOR DETERMINING THE GYROMAGNETIC RATIO OF THE PROTON IN A HIGH MAGNETIC FIELD
B. P. Kibble and G. J. Hunt Jun. 1971 33 p refs
(NPL-QU-15) Avail: NTIS

Two methods, the low-field and high-field methods are discussed which measure the gyromagnetic ratio of the proton in water by gamma sub p combining the results of these two methods, both the ampere and gamma sub p are obtained in absolute units. Measurements are described which are obtained with the prototype apparatus assembled for the high field method, in which the separation of the parallel sides was measured interferometrically in terms of the Kr 87 standard. Improvements tending towards a more accurate determination are discussed. It is concluded that the high-field method has an accuracy of the order of 0.1 p.p.m. Author (ESRO)

N72-10389# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).
BIBLIOGRAPHY ON STAR TRACKERS [ETUDE DOCUMENTAIRE SUR LES VISEURS D'ETOILE]
I. Dujardin 21 Apr. 1971 59 p In FRENCH
(LRBA-NT-12/71/BT/SAT) Avail: NTIS

A bibliographical survey of the literature on star trackers is presented, with special emphasis on design and those instruments that are suitable for daytime use or as rocket-borne instruments. ESRO

N72-10390# National Physical Lab., Teddington (England). Aerodynamics Div.
SUPERSONIC HOT-WIRE ANEMOMETRY
D. C. Collis (Aeron. Res. Lab., Melbourne) Sep. 1971 32 p refs
(NPL-Aero-Note-1101) Avail: NTIS

Details are given of the constant-current hot-wire anemometer and associated data logging equipment. Techniques for hot-wire operation in intermittent-running tunnels are discussed. Author (ESRO)

N72-10391# Groupe de Recherches Ionospheriques, Paris (France).
CHARACTERISTICS STUDY OF TOROIDAL ELECTROSTATIC ANALYZERS. APPLICATION TO SPACE PHYSICS [ETUDE DES CARACTERISTIQUES DES ANALYSEURS ELECTROSTATIQUES TOROIDAUX. APPLICATION A LA PHYSIQUE SPATIALE]
P. Decreau Jul. 1917 71 p refs In FRENCH
(GRI/NTP/88) Avail: NTIS

An electrostatic probe with electrodes in the form of a torus is discussed. The electric field was calculated by limited series expansion so that the response curves are numerically known. The role of form and size parameters on characteristics are discussed. The interelectrode electric field is determined by a rheographic process and a step by step calculation of the particle trajectories are analyzed. ESRO

N72-10392# Army Foreign Science and Technology Center, Charlottesville, Va.
A METHOD OF CREATING AN OPTICALLY DENSE IMAGE, BASED ON THE PRINCIPLE OF LIGHT SCATTERING [SPOSOB SOSOB SOZDANIYA OPTICHESK PLOTNOGO IZOBRAZHENIYA, OSNOVANNYY NA PRINTSIPE SVCTORASSEYANIYA]
E. G. Sergunin and V. P. Tikhonov 21 Jul. 1971 16 p refs Transl. into ENGLISH from Geodez. i Kartograf. (Moscow), no. 8, 1970 p 63-70
(Project T702301-2301)
(AD-727515; FSTC-HT-23-830-71) Avail: NTIS CSCL 14/5

The use of the vesicular, or Kalvar, process of reproduction is found to be ideally suited for making copies of microphotographs, particularly of a cartographic nature. The technique is described, and its advantages are listed. Author (GRA)

N72-10393# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE AUTOMATED GAS CHROMATOGRAPH AS AN AIR POLLUTANT MONITOR
Robert K. Stevens (NAPCA, Raleigh, N. C.) Dec. 1970 11 p refs Presented at the 1st Ann. Conf. on Environmental Toxicology, Fairborn, Ohio, 9-11 Sep. 1970
(Contract F33615-70-C-1046; Proj. 6302)
(AD-727521; AMRL-TR-70-102-Paper-17) Avail: NTIS CSCL 14/2

Gas chromatography has been used extensively over the past 10 years to measure atmospheric concentrations of a variety of air pollutants. However, only recently has the gas chromatograph been thought of as an analytical system which could serve faithfully as a routine air pollution monitor. It has been demonstrated that an automated gas chromatograph could be used to measure ambient as well as source concentrations of carbon monoxide, methane, sulfur dioxide and hydrogen sulfide. The paper presents details of these analytical developments and discusses their role in future monitoring programs. Author (GRA)

N72-10394# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).
AN AERODYNAMIC PENDULUM OF STANDARD DESIGN AND SIMPLE CONSTRUCTION FOR VERIFICATION OF ANEMOMETER CALIBRATIONS AT LOW VELOCITIES
P. L. Clemens May 1971 54 p refs
(VKI-TM-22) Avail: NTIS

The details of design and construction of a pendulum anemometer used to measure wind velocity are presented along with calibration data. Sources of errors are also investigated. Velocity errors of 6% are observed up to 11.5 cm/sec. It is concluded that the pendulum anemometer can be used not only as an anemometer itself, but also as a field standard for the verification of calibrations of other anemometers. In addition, in an appendix the history of the Beaufort scale used in anemometry is recalled. ESRO

N72-10395# Pennsylvania State Univ., University Park. Pennsylvania Transporation and Traffic Safety Center.
MANUAL OF HIGHWAY-PROBLEM ORIENTED PHOTO

INTERPRETATION USING PANCHROMATIC, NORMAL COLOR, AND INFRARED COLOR AIR PHOTOS
Harmer A. Weeden and John W. Harman, Jr. Oct. 1970 144 p
(P.D.H. Agreement 40851A)
(PB-200462; TTSC-7020; Rept-68-29; Rept-4655-133) Avail: NTIS CSCL 08B

The various problem areas for which photo interpretation techniques provide useful information are described. Problem areas discussed under unconsolidated materials include: roadway foundation stability and analysis, structure foundation, and characteristics of slopes, subgrades, and excavations. Problem areas discussed under rock include: roadway foundation stability and subsidence, slopes, and excavating characteristics. Special situations such as mines, tailings, and underclays, and material sources are also discussed. A major effort of the study was to evaluate the various aerial film types including panchromatic, normal color and infrared color photography. GRA

N72-10396# Intermountain Forest and Range Experiment Station, Missoula, Mont. Northern Forest Fire Lab.
AIRBORNE INFRARED FOREST FIRE DETECTION SYSTEM Final Report, Apr. 1962 - Dec. 1967
Ralph A. Wilson, Stanley N. Hirsch, Forrest H. Madden, and John B. Losensky May 1971 114 p refs
(Contract OCD-OS-72-174; ARPA Order 636)
(AD-726953; FSRP-INT-93) Avail: NTIS CSCL 02/6

The report outlines the basic requirements for an airborne infrared forest fire detection system and discusses the capability of the system to detect hot fire targets in natural forest backgrounds. Author (GRA)

N72-10397*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SILICON SOLAR CELLS AS A HIGH-SOLAR-INTENSITY RADIOMETER
Ernie W. Spisz and Ronald R. Robson Washington Nov. 1971 9 p refs
(NASA-TM-X-2412; E-6492) Avail: NTIS CSCL 10B

The characteristics of a conventional, 1- by 2-cm, N/P, gridded silicon solar cell when used as a radiometer have been determined for solar intensity levels to 2800 mW/sq cm (20 solar constants). The short-circuit current was proportional to the radiant intensity for levels only to 700 mW/sq cm (5 solar constants). For intensity levels greater than 700 mW/sq cm, it was necessary to operate the cell in a photoconductive mode in order to obtain a linear relation between the measured current and the radiant intensity. When the solar cell was biased with a reverse voltage of -1 V, the measured current and radiant intensity were linearly related over the complete intensity range from 100 to 2800 mW/sq cm. Author

N72-10398# Quality Assurance Directorate (Materials), London (England).
EXPERIMENTS IN ATOMIC ABSORPTION SPECTROSCOPY WITH A CARBON FILAMENT ATOM RESERVOIR
R. A. Mostyn and B. T. N. Newland Sep. 1970 12 p refs
(QAD-MATS-173; BR-23713) Avail: NTIS

Initial experiments with a laboratory-constructed carbon filament atom reservoir are described. The device was used in a standard commercial atomic absorption spectrophotometer, replacing the normal burner-nebulizer system. An integrating readout attachment was devised to capture the rapid signal emission given by most elements. Very high sensitivities of detection are found; magnesium and zinc can be detected at 10 picagrams, and 15 elements were detected at levels of 0.1 microgram or below. Precision is of the order + or - 10 to 15% on pure solutions. Author (ESRO)

N72-10399# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A NEW TELEVISION CHAMBER KT-91
R. S. Kharchikyan 12 Feb. 1971 21 p Transl. into ENGLISH from Tekhn. Kino i Telev. (Moscow), v. 14, no. 3, 1970 p 10-17
(AD-725300; FTD-MT-24-331-70) Avail: NTIS CSCL 17/2

A description is given of television camera KT-91 making a part of the complete set of equipment at the All-Union TV centre. The magnetic system which serves for the focusing and the deflection of the ray, is 60 mm in dia. The system contains the horizontal and vertical deflection coils, focusing, the correcting coils and coils for correction of the rhomic distortions, which allow the decrease of the grid distortions of the transmitting tube. The principle of their operation is similar to the given description of the camera KT-90. Author (GRA)

N72-10400# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HANDBOOK ON THE USE OF RADIO MEASUREMENT INSTRUMENTS, PART 1
A. I. Tereshin and V. A. Sofronov 26 Feb. 1971 496 p Transl. into ENGLISH from the report "Spravochnik po Ekspluatatsii Radioizmeritelnykh Priborov" Kiev, 1969 p 1-452
(AD-725299; FTD-MT-24-127-70-Pt-1) Avail: NTIS CSCL 14/2

Fundamental engineering characteristics most widely used in present-day radio-measuring devices are shown. Described are the principles of their operation, the order of preparing them for operation and the basic questions regarding their use. The first chapter deals with the general questions of measuring industry: verifying measurements, estimation of errors, mathematical treatment of the results, the rules of application and the preservation of measuring equipment. The remaining chapters begin with tables containing fundamental technical characteristics of the instruments of the given group. The characteristics of only the most widely used radio-measuring instruments and the elements of radio-measuring arrangements, their block-diagrams, electrical circuits and the circuits explaining the operation of certain devices are considered comprehensively. Author (GRA)

N72-10401*# Avco Corp., Wilmington, Mass. Systems Div.
FLIGHT INSTRUMENT AND TELEMETRY RESPONSE AND ITS INVERSION
M. R. Weinberger Washington NASA Sep. 1971 260 p refs
(Contract NAS1-8541)
(NASA-CR-1768; AVSD-0263-70-CR) Avail: NTIS CSCL 01D

Mathematical models of rate gyros, servo accelerometers, pressure transducers, and telemetry systems were derived and their parameters were obtained from laboratory tests. Analog computer simulations were used extensively for verification of the validity for fast and large input signals. An optimal inversion method was derived to reconstruct input signals from noisy output signals and a computer program was prepared. Author

N72-10402 Pennsylvania State Univ., University Park.
THE DESIGN AND CONSTRUCTION OF A RECORDING MICROSPECTROPHOTOMETER AND ITS USE IN INVESTIGATIONS OF INSECT VISUAL SYSTEMS Ph.D. Thesis
Alexander J. Casella 1969 108 p
Avail: Univ. Microfilms Order No. 70-19395

A wavelength scanning microspectrophotometer was constructed and absorption spectra in the 400 to 700 nm wavelength region were obtained for the screening pigments in the eyes of several types of insects. The microspectrophotometer achieves scanning operation without the use of the usual feedback loop to control the photomultiplier dynode voltage. Instead, the optical density is electronically computed directly from the reference and sample signals. A direct recording of optical density versus wavelength is obtained in this manner. Reproducibility of results to within 2.5 nm is demonstrated. Accurate measurements were obtained of filters with half-band widths as small as 10 nm at scanning speeds up to 250 nm per second. Such band widths are much smaller than those found in biological specimens. Dissert. Abstr.

N72-10403 National Lending Library for Science and Technology, Boston Spa (England).
THE TECHNIQUE OF ANTIHYPERON MEASUREMENT WITH THE NEUTRON TIME OF FLIGHT SPECTROMETER
Yu. V. Ryabov and N. Chikov 7 Sep. 1971 17 p refs Transl. into ENGLISH from Russian rept. JINR-5119, 1970
(NLL-LB/G/3040-(9091.9F); JINR-5119; P3-5119) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A large liquid cadmium-loaded scintillation detector, with an efficiency of about 90%, was used for measurements of the yield of antihyperons of an average number of prompt neutrons per fission act. The experimental arrangement, equipment, and data processing techniques are described. A.L.

N72-10298# Akademiya Nauk URSR, Kiev.
THE EFFECT OF OCEAN TIDES UPON EARTH-TIDE OBSERVATIONS
B. P. Pertsev *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 113-115 refs (See N72-10278 01-13)
Avail: NTIS

N72-10305# Technische Universitaet, Clausthal-Zellerfeld (West Germany).
OPERATIONAL TESTS OF THE ASKANIA-BOREHOLE TILTMETER (EARTH TIDE PENDULUM)
D. Flach, O. Rosenbach (Goettingen Univ., West Germany), and H. Wilhelm *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 167 (See N72-10278 01-13)
Avail: NTIS

N72-10308# Institute of Coastal Oceanography and Tides, Bidston (England).
THEORY OF MOTION OF HORIZONTAL PENDULUM WITH ZOLLNER SUSPENSION
Petr Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 180-182 refs (See N72-10278 01-13)
Avail: NTIS

N72-10309# Institute of Coastal Oceanography and Tides, Bidston (England).
CALIBRATION TESTS AND THE COMPARATIVE PERFORMANCE OF HORIZONTAL PENDULUMS AT A SINGLE STATION
G. W. Lennon and P. Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 183-193 refs (See N72-10278 01-13)
Avail: NTIS

N72-10311# Belgian Royal Observatory, Brussels.
CALIBRATION OF A GRAVIMETER BY USING A HEAVY MASS
Erwin Groten *In its* Sixth Intern. Symp. on Earth Tides 1970 p 197-202 ref (See N72-10278 01-13)
Avail: NTIS

N72-10315# Uppsala Univ. (Sweden). Solid Earth Physics Inst.
A HORIZONTAL PENDULUM STATION WITH TILT COMPENSATION
Andreas Vogel *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 213-215 refs (See N72-10278 01-13)
Avail: NTIS

N72-10316# Belgian Royal Observatory, Brussels.
A NEW TYPE ELECTROMAGNETIC TILTMETER
I. Tsubokawa *In its* Sixth Intern. Symp. on Earth Tides 1970 p 217-218 (See N72-10278 01-13)
Avail: NTIS

N72-10842*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
THE CHARACTERIZATION OF FACSIMILE CAMERA SYSTEMS FOR LUNAR AND PLANETARY SURFACE EXPLORATION
A. Eisenman *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 1-16 refs (See N72-10841 01-30)
Avail: NTIS CSCL 14E

N72-10251# Technische Univ., Berlin (West Germany).
HOT-WIRE MEASUREMENT TECHNIQUE: SOME BASIC PROBLEMS
J. D. Vagt *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 53 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

N72-10857*# Minnesota Univ., Minneapolis.
EXPERIMENT S001: ZODIACAL LIGHT PHOTOGRAPHY
E. P. Ney and W. F. Huch *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 3-16 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10858*# Naval Research Lab., Washington, D.C.
EXPERIMENT S011: AIRGLOW HORIZON PHOTOGRAPHY
M. J. Koomen, R. T. Seal, Jr., and J. Lintott (NASA. Manned Spacecraft Center, Houston, Tex.) *In* Nasa. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 17-36 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10862*# Geological Survey, Flagstaff, Ariz.
EXPERIMENT S029: EARTH-MOON LIBRATION REGIONS PHOTOGRAPHY
Elliott C. Morris *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10863*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M412: LANDMARK CONTRAST MEASUREMENTS
Charles E. Manry *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 77-80 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10864*# Dearborn Observatory, Evanston, Ill.
EXPERIMENT S013: ULTRAVIOLET ASTRONOMICAL CAMERA
Karl G. Henize, Lloyd R. Wackerling, and Albert Boggess, III (NASA. Goddard, Houston, Tex.) *In* NASA. Goddard Space Flight Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 81-99 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10865*# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENT M411: TWO COLOR EARTH LIMB PHOTOGRAPHY
Max Petersen *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 101-114 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10866*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M403: ELECTROSTATIC CHARGE
Patrick E. Lafferty *In its* The Gemini Program: Phys. Sci. Expt.

Sum. Sep. 1971 p 115-124 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20C

N72-10878*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENT S005: SYNOPTIC TERRAIN PHOTOGRAPHY
Paul D. Lowman, Jr. and Herbert A. Tiedemann *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 337-381 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10879*# Weather Bureau, Washington, D.C.
EXPERIMENT S006: SYNOPTIC WEATHER PHOTOGRAPHY
Kenneth M. Nagler and Stanley D. Soules *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 383-414 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10882*# Naval Air Development Center, Johnsville, Pa.
EXPERIMENT D015: NIGHT IMAGE INTENSIFICATION
Thomas J. Shopple, George F. Eck, and Albert R. Prince *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 431-443 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10883*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENT S030: DIM SKY PHOTOGRAPHY/ORTHICON
Lawrence Dunkleman, Robert D. Mercer, Edward P. Ney (Minnesota Univ., Minneapolis), and Curtis L. Hemenway (Dudley Observatory) *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 445-454 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10884*# Air Force Systems Command, Wright-Patterson AFB, Ohio.
EXPERIMENTS D001, D002, AND D006: BASIC OBJECT, NEARBY OBJECT, AND SURFACE PHOTOGRAPHY
Harold E. Geltmacher *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 455-466 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

N72-10885*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M410: COLOR PATCH PHOTOGRAPHY
John R. Brinkmann and Robert L. Jones *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 467-470 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N72-10404*# National Aeronautics and Space Administration, Washington, D.C.
BONDING AND JOINING TECHNOLOGY: A COMPILATION
[1971] 22 p
(NASA-SP-5925(02)) Avail: NTIS CSCL 13H

A collection of articles concerning the methods and uses of aerospace bonding and joining techniques in industrial processes is presented. Data include methods to bond and join metal components, joining techniques for adhesive materials, and shop hints for bonding and joining a variety of other items and materials. E.H.W.

N72-10405# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS OF FATIGUE TESTING OF WELDED SAMPLES OF THIN SHEET TITANIUM ALLOYS
F. Z. Tinchurin, V. S. Ivanov, and I. N. Shkanov 3 Mar. 1971 14 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (USSR), no. 105, 1969 p 68-77
(AF PROJ. 4362)
(AD-727916; FTD-HC-23-864-70) Avail: NTIS CSCL 13/5

Description of a modified Schenk-type facility with constant strain amplitude devised for fatigue testing welded titanium alloy sheet samples in pure bending. A method of calibrating the test stand to ensure symmetrical initial test loads is also proposed. The test stand makes it possible to determine the optimal welding methods for increasing the reliability and lifetime of welded structures. Author (GRA)

N72-10406# Rhode Island Univ., Kingston. Div. of Engineering Research and Development.
DYNAMIC AND THERMAL ASPECTS OF CERAMIC PROCESSING Final Technical Report, 15 Nov. 1969 - 15 Nov. 1970
Peter J. Gielisse and Joseph Stanislao 15 Dec. 1970 71 p refs
(Contract N00019-70-C-0163; Project 98-04-4030)
(AD-728011) Avail: NTIS CSCL 11/2

Thermal effects in cutting alumina ceramics was evaluated. Heat transfer models were developed which allow for the calculation of heat distribution into the major components of the grinding system, and the calculation of the interfacial diamond-workpiece temperature from direct or indirect measurements. Interfacial temperatures are found to be considerably lower than anticipated. Author (GRA)

N72-10407# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF SURFACE-ACTIVE LUBRICANTS ON THE MECHANICAL PROPERTIES OF COLD-ROLLED ALUMINUM
V. P. Severdenko, L. I. Gurskii, and N. V. Rumak 19 May 1971 15 p refs Transl. into ENGLISH from the book "Plasticheskaya Deformatsiya i Obrabotka Metallov Davleniem" Minsk, Izd-vo Nauka i Tekhnika, 1969 p 107-112
(AF PROJ. 7343)
(AD-727536; FTD-MT-24-62-71; UR/0000-69-000-000) Avail: NTIS CSCL 13/8

The mechanical properties are examined of aluminum after rolling with a surface-active lubricant and without a lubricant with different modes of deformation: for one pass and by a split mode of rolling with reductions of order of 2 percent for the pass. Author (GRA)

N72-10408# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONTINUOUS STEEL CASTING INTO SHAPED BLANKS (SELECTED PORTIONS)
V. S. Rutes, N. N. Guglin, D. P. Evteev, N. A. Nikolaev, and Yu. Ya. Kan 10 Feb. 1971 13 p Transl. into ENGLISH from mono. "Nepreryvnaya Razlivka Stali v Sortovye Zagotovki" Moscow, 1967 p 13-20
(FTD Proj. 60108)
(AD-727538; FTD-MT-24-313-70; DIA-T68-01-82; DIA-T68-01-83) Avail: NTIS CSCL 13/8

The introduction into the metallurgical industry of the method of continuous casting became possible only after the development of a stable casting process which provided stability for metallurgical production and obtaining high-grade production from castings. Research works made it possible to determine the main conditions to obtain a stable steel casting: uniform distribution of the metal while feeding it from an intermediate ladle into crystallizors; casting steel in optimum temperature ranges; providing symmetrical crystallization and forming the structure of the billets; drawing the billets at a given, and when possible, a constant range; protecting the liquid metal from oxidation in the casting process; complete solidification of the billets according to the given condition in the zone of secondary cooling; cutting the billets with a minimum of waste of the metal; and wide mechanization and automation of work of the devices. Author (GRA)

N72-10409# Army Foreign Science and Technology Center, Charlottesville, Va.
THE HIGH TEMPERATURE THERMOMECHANICAL TREATMENT OF LARGE STEEL FORGINGS [VYSOKOTEMPERATURNAYA TERMOMEKHANICHESKAYA OBRABOTKA KRUPNYKH POKOVOK IZ STALI]
V. D. Sadovskii, B. V. Titorov, Ye. N. Sokolokov, V. K. Farafonov, V. V. Negodyayev, and M. M. Nichkova 4 Nov. 1970 10 p Transl. into ENGLISH from the publ. "Stuktura i Svoysteva Zharoprochnykh Metallicheskikh Materkallov" USSR, 1967
(Proj. T702301-2301)
(AD-727498; FSTC-HT-23-427-70) Avail: NTIS CSCL 13/8

The possibility of employing high-temperature thermomechanical treatment (HTT) in the hardening of large forgings of E1612K steel is investigated. The results revealed that under the conditions outlined HTT resulted in an increase in strength and high-temperature strength properties with a sufficient degree of uniformity throughout the section of the forging. GRA

N72-10410# Grumman Aerospace Corp., Bethpage, N.Y.
ADVANCED CHEMICAL MILLING PROCESSES Final Technical Report, 1 Jul. 1969 - 31 Dec. 1970
Christian J. Staebler, Jr. Wright-Patterson AFB, Ohio AFML Mar. 1971 216 p
(Contract F33615-69-C-1840; AF Proj. 705-9; MMP-705-9)
(AD-727620; AFML-TR-71-44) Avail: NTIS CSCL 13/8

The program objective was to improve the capability, reliability, and cost effectiveness of chemical milling when applied to selected aerospace structural materials. A completely automated, centrifugal regeneration system for titanium hydrofluoric acid etchant was designed, fabricated, and tested. This system automatically analyzes the etchant, adds fresh acid, determines the titanium concentration, and activates a centrifuge which removes precipitated titanium and reclaims the etchant. A new, styrene-butadiene maskant was developed that gives excellent line definition on titanium substrates and that can be manufactured for about one-half the cost of commercially available maskants. The feasibility of using a laser-drilled, high-energy water jet to scribe chem-milling maskants was established. Optimum chem-milling/forming methodizing sequences were established that minimize distortion of titanium alloy detail parts. Sampling and analytical techniques were established for the major pollutants emitted by chem-milling operations. Air pollution control agencies and equipment manufacturers were surveyed. Author (GRA)

N72-10411# GCA Technology Div., GCA Corp., Bedford, Mass.
FABRIC FILTER SYSTEMS STUDY. VOLUME 1: HANDBOOK OF FABRIC FILTER TECHNOLOGY
Charles E. Billings and John Wilder Dec. 1970 649 p refs
(Contract CPA-22-69-38)
(PB-200648; GCA-TR-70-17-g-Vol-1; APTD-0690-Vol-1) Avail: NTIS HC $9.00/MF $0.95 CSCL 13K

A review is presented of fabric filter technology in which the following areas are discussed extensively: current developments in fiber fabric treatments and applications; the pressure drop, efficiency, and performance characteristics observed in operating fabric filters and their relationship to the underlying physical and chemical phenomena of the collection process; the description of models of available fabric collectors; fabric and filter properties of importance in application for industrial gas filtration; engineering factors involved in the design of the overall system; data on pressure drop performance and its variation; practical guidelines for estimating the cost of various fabric filtration approaches; and operation and maintenance of fabric filters. GRA

N72-10412# GCA Technology Div., GCA Corp., Bedford, Mass.
FABRIC FILTER SYSTEMS STUDY. VOLUME 2: APPENDICES TO HANDBOOK OF FABRIC FILTER TECHNOLOGY
Dec. 1970 228 p refs
(Contract CPA-22-69-38)
(PB-200649; GCA-TR-70-17-G-Vol-2; APTD-0691-Vol-2) Avail: NTIS CSCL 13K

Tabulation of the early history of the use of fabrics for dust and fume filtration is presented as well as principal U.S. manufacturers of cloth filter dust and fume collectors; estimated 1968 and 1969 fabric filter sales, an estimate of the fabric filter market and fabric filter applications in the non-metallic minerals industry. The force of adhesion between a sphere and cylinder in liquid contact is discussed along with specific dust fabric filter resistance coefficients. A fabric filter manufacturers' summary for 1969; a glossary of fabric terminology; some inorganic and metal fibers potentially suitable for high temperature filtration or control of electrostatic effects in fabrics; a chart of fiber properties, and electrical resistance vs. humidity; 1969 suppliers list, filter fabrics, and related materials plus supplier brochures; and a hopper configuration bibliography are included. GRA

N72-10413# GCA Technology Div., GCA Corp., Bedford, Mass.
FABRIC FILTER SYSTEMS STUDY. VOLUME 3: BIBLIOGRAPHY
Dec. 1970 179 p refs
(Contract CPA-22-69-38)
(PB-200650; GCA-TR-70-17-g-Vol-3; APTD-0693-Vol-3) Avail: NTIS CSCL 13K

A bibliography resulting from a literature search used in preparation of a handbook of fabric filter technology is presented. Five hundred reports were found, indexed, and coded for retrieval. The reports are listed by author(s) and index description. (GRA)

N72-10414# GCA Technology Div., GCA Corp., Bedford, Mass.
FABRIC FILTER SYSTEMS STUDY, VOLUME 4 Final Report
Dec. 1970 130 p refs
(Contract CPA-22-69-38)
(PB-200651; GCA-tr-70-17-g-Vol-4; APTD-0692-Vol-4) Avail: NTIS CSCL 13K

A study for the definition of two alternative five-year research and development programs based on different levels of funding for fabric filter systems used in air pollution control applications is described. The plans provide specific performance, to improve economics of usage, and to promote extension of fabric filtration to control of a greater number of applications. Specific tasks undertaken include: survey of engineering technology available as data or analytical design and operation equations; the identification and investigation of practices, limitations, and problems of fabric filter systems in use and in possible future applications; and a review of the major types of fabric filter equipment available. GRA

N72-10415# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF SHEAR COEFFICIENT IN ROLLING
M. M. Gorenshtein 4 Feb. 1971 12 p refs Transl. into ENGLISH from the book "Plasticheskaya Deformatsiya i Obrabota

Metalov Davlenim" Minsk, Izd-vo Nauka i Tekhnika, 1969 p 26-31
(FTD Proj. 7343)
(AD-724969; FTD-HT-23-33-71) Avail: NTIS CSCL 13/8

The article proposes several methods to determine the shear coefficient. In order to explain the physical essence of the shear coefficient, the conditions of mixed friction in rolling are examined. Using the shear coefficient as a friction characteristic in rolling is recommended over a friction coefficient, also different lubricants are considered. Author (GRA)

N72-10416# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF LUBRICATING FILMS ON THE LAWS OF SLIDING FRICTION
S. N. Postnikov and A. N. Yashina 2 Feb. 1971 9 p refs
Transl. into ENGLISH from Tr. Gorkovsk. Politekhn. Inst. (Gorki), v. 24, no. 11, 1968 p 33-36
(FTD Proj. 7343)
(AD-724971; FTD-HT-23-48-71; UR/0000-68-024-011) Avail: NTIS CSCL 20/11

The dependence of friction force on the normal load was examined. For the friction pair tungsten steel low steel appeared to be defined by B. V. Deryagin equation: F equals mu where mu is the friction coefficient, P omicron the SP. mol. interaction force, and S PHI the actual contact surface. Several load cycles were investigated. For the first loading when the surfaces were cool and covered with protective oxide layers, F equals mu because the contribution of the mol. component to F was very low. After the surfaces were heated the protective layers were disturbed and mu increased because the number of the adhesion centers increased. When the surfaces that were heated during the preceding cycle were loaded, mu decreased rapidly because of the lubricating (fused) metal layers formed. The effect was also examined for the friction pair CU steel of lubricating films. GRA

N72-10417# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF ELECTROPOLISHING ON THE CHANGE IN THE SURFACE LAYER STATE DURING WEAR
A. D. Kornev, N. F. Kuzmin, G. K. Gorobets, A. V. Panko, and N. A. Oplochenko 29 Jan. 1971 15 p refs Transl. into ENGLISH from Khim. Tekhnol., Resp. Mezhvedomstvennyy Nauchno-Tekhn. Sb. (USSR), no. 11, 1968 p 132-140
(AF Proj. 7343)
(AD-724989; FTD-HT-23-892-70) Avail: NTIS CSCL 13/9

The article contains a study of the effect of electropolishing on the change in state of the surface layer of 20KhNZA steel case hardened to a depth of 0.7 to 1.1 mm, quenched and tempered to HRC 58-60 during the process of wear. It was established that the break in time and wear of electropolished surfaces under contact loads are reduced appreciably. The microhardness of electropolished surfaces increases during the break in process by comparison with the initial microhardness and also by comparison with a ground surface not subjected to electropolishing. Electropolishing of the indicated steel with improvement of the microgeometry of the operating surface creates conditions for fast break-in, promotes work hardening and strengthens the surface layer of the metal, and it greatly reduces the wear of the operating surfaces of working machine parts. Author (GRA)

N72-10418# Cryomech, Inc., Jamesville, N.Y.
VUILLEUMIER REFRIGERATOR ANALYSIS: LOW TEMPERATURE DESIGN OPTIMIZATION Final Report, Jan. - Nov. 1970
Robert A. Ackermann May 1971 73 p refs
(Contract DAAK02-70-C-0291)
(AD-724770; FR-1001) Avail: NTIS CSCL 13/1

In published analyses of the Vuilleumier refrigeration cycle, it has been assumed that the gas in the various volumes of the system go through variations in pressure isothermally. Actually, the gas approaches isentropic conditions in these volumes, leading to a significant difference. An analysis is presented which includes this effect along with the effects due to void volume, the regenerator inefficiency, motional heat leak, longitudinal conduction, and the pressure drop. The analysis was made considering both sinusoidal and linear displacer motions. The results obtained lead to two useful considerations. The first is that improved performance can be obtained with other than sinusoidal displacer motion. The second is that the big problem in Vuilleumier cycle refrigeration is in obtaining sufficiently high pressure ratios when one takes into account reasonable void volumes and the regenerator pressure drops. This becomes especially true for temperatures below 15K. Author (GRA)

N72-10419# Technische Hochschule Stuttgart (West Germany). Inst. fuer Umformtechnik.
INVESTIGATIONS INTO THE PRECISION BLANKING OF STEEL AND NONFERROUS METALS Ph.D. Thesis **[UNTERSUCHUNGEN UEBER DAS GENAUSCHNEIDEN VON STAHL UND NICHTEISENMETALLEN]**
Wilfried Kraemer 1969 229 p refs In GERMAN
Avail: NTIS

Processes for accurate metal plate blanking are reviewed. The influence of different factors such as tool form and counter reaction force of the supports, on the geometry of the cut surface are analyzed. Tests were performed on carbon steels, bronzes, and aluminum alloys. It is found that the main parameters are the grain size of the material and the thickness of the plate. Author (ESRO)

N72-10420# Minnesota Univ., Minneapolis. Physical Electronics Lab.
RESEARCH ON THE SPUTTERING OF MULTICOMPONENT MATERIALS BY ION BOMBARDMENT
Gottfried K. Wehner and Ming L. Tarng May 1971 46 p refs
(Contract N00014-67-A-0113-0012)
(AD-724960) Avail: NTIS CSCL 11/3

Experiments on cone formation in sputtering of multicomponent materials were continued. Auger electron spectroscopy of insulator surfaces poses no particular problems when one operates with the primary beam energy in regimes where the secondary electron coefficient is larger than unity. The main part of the work concerns in situ Auger electron spectroscopy studies of sputter deposition and sputter removal of Mo from various metal surfaces. The sputtering yield of Mo atoms from Cu, Au, Al especially at low ion energies is much lower than that of Mo from Mo. The 200 eV Ar ions remove Mo atoms from an Al surface with a yield which is only 1/1000 of the bulk Mo yield. Mo monolayer islands protect the underlying Cu, Au, Al from being sputtered and this is responsible for the formation of cones. A significant conclusion is that the use of low energy ion bombardment for layer removal and determination of composition profiles may often lead to erroneous results. Author (GRA)

N72-10421# Air Force Systems Command, Wright-Patterson AFB, Ohio.
STUDY OF THE FRICTION PROCESS DURING VIBRATION CUTTING OF REFRACTORY ALLOYS
V. N. Poduraev and V. I. Valikov 12 Feb. 1971 12 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Mashinostr.
(AF Proj. 7343)
(AD-724998; FTD-HT-23-80-71) Avail: NTIS CSCL 13/8

The article describes investigations of friction under conditions approximating friction along the front and rear edges of a tool during vibrational cutting (drilling), and based on study of the magnitude of normal pressure on the study of the friction pair (VK8 hard tool alloy and Kh18N9T stainless steel), and on the magnitude of the cutting speed. For the study, special equipment was designed and added to a modified lathe. This equipment and the set-up used to produce intermittent vibrational cutting are described briefly. Two sets of relationships were derived, the first for friction in castor oil and sulphafrezol and in dry friction at low feed pressures and friction in sulphafrezol and in dry friction at higher rates and pressures. The experiment data indicate that the character of the relationships for dry friction and friction in sulphafrezol coincide. It was determined that vibrational cutting produced lower friction coefficients than steady cutting; however, an increase in the torsion moment with time was noted. This is explained as being due to increasing friction on the rear surfaces of the drill. Author (GRA)

N72-10422# Air Force Systems Command, Wright-Patterson AFB, Ohio.

STUDY OF THE INFLUENCE OF METAL SURFACE FINISH ON WEAR RESISTANCE OF A METAL/POLYAMIDE FRICTION PAIR DURING FRICTION IN WATER

A. A. Kutkov and Yu. B. Kornilov 19 Feb. 1971 10 p refs Transl. into ENGLISH from Politekhnicheskii Institut, Novocherkassk, Trudy (USSR), v. 187, 1969 p 110-113
(AF Proj. 7343)
(AD-724997; FTD-HT-23-45-71) Avail: NTIS CSCL 13/9

Steel, bronze, or stainless steel shafts were rotated at 0.25 m-sec linear velocity and at a given loading in annular bearings made of resin P-68 (polyamide resin), submerged in deionized water. The loss of P-68 depended on the degree of cleanliness of the shaft. The attrition rates were greatest at the start, i.e., during the wearing-in period. Steel shafts caused more rapid wear than the stainless steel shafts since the former oxidize more readily, forming given abrasive particles. Author (GRA)

N72-10423# Air Force Systems Command, Wright-Patterson AFB, Ohio.

THE SCIENTIFIC AND TECHNICAL CONFERENCE ON THE DIFFUSION JOINING OF METALLIC AND NONMETALLIC MATERIALS (6TH)

N. F. Kazakov and V. N. Kazakov 5 Feb. 1971 11 p Transl. into ENGLISH from Conf. of Izv. Vyssh. Ucheb. Zaved., Mashinostr. (USSR), no. 1, 1970 p 186-189
(FTD Proj. 142610)
(AD-724995; FTD-HT-23-42-71) Avail: NTIS CSCL 13/8

The sixth conference on the diffusion combination of metallic and nonmetallic materials met in Moscow on 12-13 May 1969. The conference was attended by 300 representatives of 76 organizations from 33 cities of the country; it heard 30 reports on the questions of joining nonmetallic materials (graphite, sapphire, glass, ceramics) with metals and also with refractory, porous, and heat-resistance metals and alloys. GRA

N72-10424# Mechanical Technology, Inc., Latham, N.Y.

DYNAMIC STABILITY OF GIMBALED SPIRAL-GROOVED THRUST BEARINGS

Alston L. Gu, , Coda H. T. Pan, and Robert H. Badgley May 1971 63 p refs
(Contract N00014-70-C-0135; NR Proj. 062-317)
(AD-725164; MTI-71TR26) Avail: NTIS CSCL 13/9

A general, easily-implemented technique is developed by which stability maps may be determined for gimbaled, gas-lubricated, spiral-grooved thrust bearings. This technique is based upon the spectral analysis (frequency domain) method, in which the neutrally-stable states of the stator-gimbal system are determined through solution of the system's characteristic equations. The method proved effective for conducting low-cost investigations of the sensitivity of system instability thresholds to changes in various system design parameters. Containing data valid for a wide range of gimbal inertias, stability maps are presented for a range of bearing compressibility numbers, for several bearing geometries, and for several values of mechanical damping in order to illustrate both the power of the technique and also its effectiveness. Limited experimental information which is presently available verified the essential features of the corresponding stability maps. The technique was reduced to a form usable in the design of gas bearings for use in gas turbine engines. Author (GRA)

N72-10425# General Dynamics/Fort Worth, Tex.

DEVELOPMENT OF COMPOSITE TAPE LAYING PROCESS FOR ADVANCED FIBROUS REINFORCED COMPOSITE STRUCTURES Final Technical Report, Dec. 1966 - Jan. 1971

W. O. Sunafrank, W. H. Drebing, and H. L. Eaton Mar. 1971 421 p
(Contract F33615-67-C-1271; AF Proj. 872-7)
(AD-725765; AFML-TR-71-71; FTR-15) Avail: NTIS CSCL 13/9

The objective of the research was to develop and fabricate a numerically controlled prototype tape laying machine for performing layup operations required by airframe structural components of filament reinforced resin matrix composites. Mechanical functions of the machine as related to airframe component design requirements were investigated and defined. These included machine head variables of roller type, heat and pressure application, laying rates, tape feed mechanisms, shearing methods, disposal of cutoffs and tape specifications. In addition, compound contour requirements were considered. These included tilting vertical axis, pivot rollers, self-shaping rollers, and draping of flat layups to contour. It was determined that 75 percent of the airframe surfaces could be laid while using either the self-shaping roller or drape to shape approach, thereby eliminating the complexity factor of a 5-axis tilting head and the association of high production costs. A major problem has been tolerance control of fiber placement on the carrier. The contract has provided an improved manufacturing technology through development of an NC tape laying machine that will apply fiber reinforced tape up to 3 inches wide, to a part along a preprogrammed path. Author (GRA)

N72-10426 National Lending Library for Science and Technology, Boston Spa (England).

PRESSURES AND TORQUES WHEN FORMING COLD-BENT CHANNEL SECTIONS

I. S. Trishevskii, L. N. Kotelevskii, V. V. Klepanda, G. R. Kheifets, and S. V. Zelenskii 1971 12 p refs Transl. into ENGLISH from Stal (Moscow), v. 3, 1971 p 238-241
(NLL-M-21046-(5828.4F); Rept-86S) Avail: Natl. Lending Library Boston Spa, Engl.: 2 NLL photocopy coupons

A method is presented for calculating the pressure of metal on the rolls and the torques when forming cold-bent channels on section-bending units. An algorithm is proposed for solving the problem by computer, and the possible grades in section-bending units at a metal works plant are determined. The calculated values of the power parameters of the shaped channels differ from the actual results by not more than 15%. Author

N72-10427 National Lending Library for Science and Technology, Boston Spa (England).

ANALYSIS OF THE RELIABILITY OF PLASTIC ENCAPSULATED DEVICES

H. Arciszewski 19 Aug. 1971 22 p Transl. into ENGLISH from L'Onde Elec. (Paris), v. 50, no. 3, Mar. 1970 p 230-240
(NLL-PORS-Trans-2702-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Some recent results concerning the reliability of electronic devices encapsulated in plastic are presented in graphical and tabular form. Author

N72-10428 National Lending Library for Science and Technology, Boston Spa (England).

IONIC SILICONIZING OF MOLYBDENUM USING THE CIRCULATION METHOD

B. N. Arzamasov and V. N. Glushchenko 1971 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 14, no. 3, 1971 p 133-135
(NLL-M-21066-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method of ionically siliconizing molybdenum by circulating a hydrogen-free gaseous medium is investigated and the results reported. Basic process parameters are established for the process. Coatings of various thickness can be obtained with glow discharge in diffusion siliconizing conditions by keeping constant the temperature and molybdenum saturation time and altering the electric discharge parameters as required. Author

N72-10843*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Astrionics Div.
RELIABILITY ESTIMATION PROCEDURES AND CARE: THE COMPUTER-AIDED RELIABILITY ESTIMATION PROGRAM
F. P. Mathur *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 17-26 refs (See N72-10841 01-30)
Avail: NTIS CSCL 14D

N72-10889*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT D016: POWER TOOL EVALUATION
Victor L. Ettredge *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 513-522 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 13I

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N72-10429# Commissariat a l'Energie Atomique, Limeil (France). Centre d'Etudes.
LASER-SOLID DEUTERIUM INTERACTION: NUMERICAL STUDY [INTERACTION LASER-DEUTERIUM SOLIDE: ETUDE NUMERIQUE]
Francis Floux and Andre Billebize Feb. 1971 75 p refs In FRENCH
(CEA-R-4148) Avail: AEC Depository Libraries

After a recall of the problem and the different theoretical approaches already attempted, a computer code was developed in order to give an account of the experimental results. Comparisons between numerical and experimental data were successfully achieved. Author (NSA)

N72-10430*# Scientific Translation Service, Santa Barbara, Calif.
APPLICATION OF LASERS IN SPECTROSCOPIC ANALYSIS [BUNKO BUNSEKI NI OKERU REZA NO OYO]
H. Kichinosuke Washington NASA Nov. 1971 19 p refs Transl. into ENGLISH from Kinzolu Gakkai kaiho (Japan), v. 10, no. 3, p 149-155
(Contract NASw-2035)
(NASA-TT-F-14010) Avail: NTIS CSCL 20E

The application of lasers to spectroscopic analysis in metallurgical studies is discussed. Particular reference is made to Raman spectroscopy and laser microprobes. Author

N72-10431*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC THIN FILM ANALYZER Patent Application
John R. Williams and Burnice N. Norden, inventors (to NASA) Filed 30 Aug. 1971 11 p
(NASA-Case-MFS-20823; US-Patent-Appl-SN-175981) Avail: NTIS CSCL 20E

A system for the analysis and measurement of thin films is presented. The light output of a laser is split into two beams, a first beam being focused to illuminate the entire area of a photographic plate and a second beam being collimated and directed through a small portion of the photographic plate onto the sample which is coated with the film to be observed. The surface of the sample is positioned at a slight angle with respect to a plane normal to the second beam and the light reflected from the sample arrives back at the photographic plate in a region other than that through which the second beam originally passed. By making successive exposures during the deposition of material on the surface of the sample, holograms are recorded on the photographic plate. The plate is then developed and interference lines of the hologram (or holograms, in the case of a transparent object) are representative of the thickness of the film or material deposited between exposure times. NASA

N72-10432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent Application
Robert L. McKenzie, inventor (to NASA) Filed 26 Apr. 1971 14 p
(NASA-Case-ARC-10370-1; US-Patent-Appl-SN-137391) Avail: NTIS CSCL 20E

A laser is provided which utilizes the infrared vibration rotation transitions of a diatomic gas such as carbon monoxide. The laser action is produced by an active diatomic gas such as carbon monoxide mixed with a vibrationally resonant pumping gas such as nitrogen. In addition, a noble gas such as argon may be employed as a third gas in the mixture. The gas mixture contains from 1 to 80 percent by volume of the active gas based on the pumping gas, and the third gas, if used, can constitute up to 90 percent of the total gas volume. A number of significantly different wavelengths can be produced by the laser. A single laser may contain several optical resonators at different locations, so that the desired wavelength can be selected at will. NASA

N72-10433# Naval Postgraduate School, Monterey, Calif.
THE CO2-HN3 LASER: DESIGN AND CONSTRUCTION OF A MOLECULAR LASER PUMPED BY PHOTOLYSIS OF HN3 M.S. Thesis
Gunther Paul Schnez Jun. 1971 93 p refs
(AD-727662) Avail: NTIS CSCL 20/5

A CO2-HN3 laser is designed and constructed. The use of hydrazoic acid, being highly explosive and toxic, requires a design where the gas handling and optical systems are located inside a fume hood with exhaust to the outside. The laser utilizes a pumping scheme where energy released by the photolysis of HN3 is used to create a population inversion in CO2. The major highlights of the developmental work are: (1) design and fabrication of the laser tube and resonant cavity, (2) design, construction and operation of the HN3 generating and gas filling systems, and (3) flashlamp discharge circuit design and development of the charging control system. Operation of the laser is the subject of subsequent work with the system. Preliminary experiments and suggestions are included in this study. Furthermore the basic principles and equations governing the operation of a CO2-HN3 laser are derived. Author (GRA)

N72-10434# Michigan Univ., Ann Arbor. Mount Haleakala Observatory.
A LUNAR LASER REFLECTOR EXPERIMENT PERFORMED DURING THE APOLLO 11 MOONWALK
J. D. Erickson and P. D. McCormick Oct. 1971 60 p refs
(Contract DAHC15-68-C-0144)
(AD-724735; TR-1386-43-T) Avail: NTIS CSCL 17/8

The report summarizes an experiment to detect a retroreflector array placed on the moon by the Apollo 11 astronauts (by measuring the magnitude of the return of a reflected ruby-laser beam directed at the reflector array) before the astronauts left the moon. The Mount Haleakala Observatory on Maui, Hawaii, was in a location such that the moon and the Sea of Tranquillity site on the moon were observable during the moonwalk. Author (GRA)

N72-10435# Case Western Reserve Univ., Cleveland, Ohio. Div. of Electrical Sciences and Applied Physics.
STARK EFFECT MODULATION STUDIES Final Report, 18 Mar. 1968 - 31 Dec. 1970

Yoh-Han Pao, Paul C. Claspy, and W. B. Johnson 18 Mar. 1971 73 p refs
(Contract F19628-68-C-0183; AF Proj. 4645-07-01)
(AD-725067; AFCRL-71-0179) Avail: NTIS CSCL 20/5

It has been determined that it is practical to use the molecular Stark effect in gases to modulate laser radiation in the 10 micron region. A large number of suitable modulator gas constituents have been studied and parameters governing gas cell modulator design have also been identified. Such modulators may be used both within and external to the laser cavity. In intra cavity configurations, large modulation depths are easily obtained with low modulator power. Results of theoretical studies indicate that within the frequency ranges of practical interest, there is no intrinsic limit to the frequency response. However when modulating frequency is larger than the value of the homogeneous linewidth, there is a decrease in effectiveness. Experimental results showing non-dispersive modulation at frequencies to 30 megahertz have been obtained. Author (GRA)

N72-10436# ILC, Inc., Sunnyvale, Calif.
OPTICAL PUMPS FOR ERBIUM LASERS First Triannual Report, 1 Jul. - 1 Nov. 1970
Lowell Noble Apr. 1971 71 p refs
(DA Proj. 1H6-62705-A-055-02-64)
(AD-724732; ECOM-0296-1) Avail: NTIS CSCL 20/5

The overall objective is to produce more efficient pulsed optical pumps for erbium lasers. Both xenon and alkali-metal vapor lamps are being studied. Laser materials, both glass and YAG, were selected and their absorption and excitation spectra determined. Fluorescence life times, sensitizer transfer characteristics and decay processes have been catalogued. Thirty-six xenon lamps of various bore diameters and pressures and two cesium lamps were constructed. Initial light output measurements on xenon lamps indicate that the useful light output is independent of the pulse length and current density for pulse lengths of 0.5 to 2.5 milliseconds rendering optimization of this lamp type difficult. Design criteria for alkali metal power supplies were established and cesium lamps were operated. Author (GRA)

N72-10437# ILC, Inc., Sunnyvale, Calif.
OPTICAL PUMPS FOR LASERS Final Report, 1 Oct. 1969 - 30 Nov. 1970
Lowell Noble, John P. Moffat, Leonard Reed, and John Richter May 1971 141 p refs
(Contract DAAB07-70-C-0035; DA Proj. 1Hg-62705-A-055-02-59)
(AD-724733; ECOM-0035-F) Avail: NTIS CSCL 20/5

The results of a twelve month program to improve the efficiency of optical pumps for Nd:YAG lasers are presented. The first task was the development of a flash lamp for pumping Q-switched Nd:YAG lasers at 10 joules per pulse with pulse repetition rates up to 10 pulses per second, and an overall efficiency of 2%. This goal was achieved through improving both the lamp and the circuit. Substantial efficiency improvements were achieved by simmer-pulse operation. A pseudo-simmer circuit was developed that achieves good efficiency and uses only lightweight components. The second task was the development of a lamp for pumping CW Nd:YAG laser with 5% overall efficiency at 1kW input. Author (GRA)

N72-10438 Purdue Univ., Lafayette, Ind.
LASER RAMAN SPECTROSCOPY OF SOLIDS Ph.D. Thesis
Stuart Allan Solin 1970 228 p
Avail: Univ. Microfilms Order No. 70-18735

The first and second order Raman spectra of diamond were studied using the 4880A and 5145A lines of an Argon ion laser and the 6328A line of a He-Ne laser. The spectra were recorded at room, liquid helium, and liquid nitrogen temperatures. In addition to the second order spectrum previously reported a new weaker second order spectrum was observed in the range 1600 to 2100/cm. Polarization studies were carried out on both the first and the second order spectra. From such studies it was established that the 1332/cm Raman line is the zone center optical phonon with gamma(25+)(F2g) symmetry. Photoluminescence systems of diamond observed at room, liquid nitrogen, and liquid helium temperature are studied and discussed briefly. The Raman spectrum of the optically active organic crystal benzil was studied extensively with the 6328A radiation from a He-Ne laser as the exciting radiation. Dissert. Abstr.

N72-10304# California Univ., La Jolla. Inst. of Geophysics and Planetary Physics.
A LASER EARTH STRAINMETER
Jon Berger and R. H. Lovberg *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 154-166 refs (See N72-10278 01-13)
Avail: NTIS

N72-10256# Institut Franco-Allemand de Recherches, St. Louis (France).
LASER BEAM USAGE FOR OPTO-ELECTRONIC METHODS OF INVESTIGATING GASEOUS FLOWS
H. J. Pfeifer *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 21 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

N72-10888*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M406, OPTICAL COMMUNICATIONS
Douglas S. Lilly *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 509-512 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20E

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N72-10439# Skoda Works, Pilsen (Czechoslovakia). Nuclear Power Plants Div.
INFLUENCE OF SOME METALLURGICAL VARIABLES ON THE RADIATION DAMAGE SENSITIVITY OF PRESSURE VESSEL STEELS
M. Brumovsky 1971 31 p refs Presented at Symp. on Effects of Radiation on Structural Mater., Niagara Falls, Ontario, 29 Jun. - 1 Jul. 1970
(ZJE-99; Conf-700630-2) Avail: AEC Depository Libraries

Studies of binary and ternary alloys of Fe-C-Mn type were performed to understand the mechanism of radiation hardening and embrittlement in nuclear reactor low-carbon pressure vessel steels. Results of static tensile tests showed the substantial effect of carbon and manganese contents. Carbon, with respect to pearlite content in alloys, increases the resistance against radiation damage during irradiation at 80 to 100 C, while manganese content higher than 0.5 to 1.0 wt % decreases this resistance. Supersaturation connected with the decrease of yield strength was observed in iron and Fe-C type alloys at neutron doses higher than 5 X 10 to the 19th power n/sq cm. Influence of the initial yield strength value upon its increase during irradiation was shown for low-carbon steel with various heat treatment or cold work value. Author (NSA)

N72-10440*# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
PROSPECTS FOR HIGH STRENGTH ZIRCONIUM ALLOYS
N. R. McDonald 1971 28 p refs Presented at the Conf. on

Metals, Sydney, Australia, May 1971
(Conf-710513-1) Avail: AEC Depository Libraries

A review of zirconium alloy development and properties is presented. Primary applications are identified as, 1) pressure tubes for water-cooled power reactors, where the design limitation near 300 C is the creep of the tubes; 2) the potential application of satisfying the requirement for a strong alloy tube containing superheated steam at 450 to 500 C. Creep strength is again the limiting factor, but at these temperatures it is not influenced by fast neutron irradiation to the same extent as at lower temperatures. Properties and behavior of available zirconium alloys are summarized. The application of behavioral data of zirconium alloys to the design of pressure-tubes in their present state is outlined, and an extrapolation is made to the required properties of an alloy for containing superheated steam. Progress in the incorporation of strengthening materials is also discussed. NSA

N72-10441# Virginia Polytechnic Inst., Blacksburg. Dept. of Metals and Ceramic Engineering.

THE RELATIONSHIP OF NITROGEN CONTENT TO THE SUSCEPTIBILITY AUSTENITIC STAINLESS STEELS TO STRESS CORROSION Quarterly Report, 1 Jun. - 31 Aug. 1970

G. S. Clevinger and Jack L. Lytton Sep. 1970 13 p refs
(Contract AT(40-1)-4052)
(TID-25554; QR-1) Avail: NTIS

Work during the quarter is summarized. As-received Type 304 material was examined both metallographically and with the electron microscope. Methods of specimen preparation were developed and tested, and characteristic data were collected, including those on electron diffraction. The gas-nitriding apparatus was refurbished and recalibrated and preparation were made for initial production of increased-nitrogen alloys. Supplies and equipment were collected and tested where necessary. Specimens of as-recived Type 304 were cut to standard test dimensions and given various amounts of tensile deformation using an Instron machine. The substructural dislocation configurations produced are being examined in the electron microscope and compared with the configurations produced in the fully annealed state. Preliminary designs have been considered for apparatus which will have the capability for stress corrosion testing of austenic stainless steel specimens having increased nitrogen contents under conditions of static tensile loading. Author (NSA)

N72-10442# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

SURFACE TREATMENT OF 304L STAINLESS STEEL

Thomas C. Johnson and L. Harry Faber 10 Dec. 1970 4 p
(Contract AT(29-1)-1106)
(RFP-1564; Dr-1649) Avail: NTIS

Preparation of the surface of machined 304L stainless steel parts prior to welding, plating, and other operations is a common manufacturing process. One common method of preparation is by immersion in a solution containing nitric acid and a fluoride ion additive. This process removes small amounts of metal from surfaces exposed to the acid solution. An experimental investigation to determine the process parameters effecting metal removal rate by this preparation process is described. Temperature and nitric acid concentration of the bath were found significant to metal removal rate; concentration of the fluoride ion additive was not significant to metal removal rate. Metal removal rate was approximately proportional to temperature raised to the third power, and inversely proportional to nitric acid concentration. Author (NSA)

N72-10443# California Univ., Berkeley. Lawrence Radiation Lab.

CARBON REPLICA PREPARATION FOR ELECTRON MICROSCOPY

Walter T. Gibs and Rolf H. Muller Aug. 1970 20 p refs
(Contract W-7405-eng-48)
(UCRL-18818-Rev) Avail: NTIS

Detailed procedures are given for the preparation of two-step carbon replicas of metal surfaces for examination by transmission electron microscopy. The technique employs a plastic replicating film and is particularly suited for metal surfaces resulting from electrochemical dissolution. Author (NSA)

N72-10444# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.

EXAMINATION OF 2 1/4 Cr-1 Mo FERRITIC STEEL TUBES EXPOSED TO SMALL LEAKS OF WATER IN FLOWING SODIUM

W. T. Lee 1 Feb. 1971 75 p refs
(Contract AT(04-3)-700)
(LMEC-70-21) Avail: NTIS

Metallurgical examinations and evaluations were performed on a group of 2 1/4 Cr-1 Mo ferritic steel target tubes. These tubes were exposed to small leaks of water in 600 F flowing sodium. The extent of wastage was determined by dimensional and volumetric measurements. Metallographic, hardness, and scanning electron microscopic analyses indicate that the tube wastage process was controlled by: (1) droplet impingement, and (2) temperature rise in the target tube caused by sodium-water reaction. A probable mechanism of wastage for the tubes is postulated. Author (NSA)

N72-10445# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STRENGTH VARIATIONS IN FATIGUE TESTS

E. K. Pochtennyi 4 Mar. 1971 18 p refs Transl. into ENGLISH from the publ. "Mekhanicheskaya Ustalost v Statisticheskom Aspekte" USSR, 1969 p 150-159
(Contract F33657-71-d-0057; AF Proj. 4362)
(AD-727836; FTD-HC-23-884-70; UR/0620-69-000 000) Avail: NTIS CSCL 11/6

The report analyzes the causes of the dispersion of the lifetime of machine parts under conditions of homogeneous cyclic loading. It is shown that under these conditions the lifetime dispersion is determined by the dispersion of the fatigue limit values for the set of parts considered. The possibility of using three parameter and normal lifetime functions is confirmed experimentally. Author (GRA)

N72-10446# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANTIFRICTION PROPERTIES OF BINARY ALLOYS OF ALUMINUM-COPPER AND ALUMINUM-MANGANESE IN RELATION TO THEIR STRUCTURAL DIAGRAMS

A. G. Vinitskii, A. V. Galyko, and B. I. Kostetskii 24 May 1971 13 p refs Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 6, 1969 p 118-122
(AF Proj. 7343)
(AD-727468; FTD-MT-24-51-71) Avail: NTIS CSCL 11/6

A study was made of the effect of the chemical composition and structures on the antifriction properties of binary alloys Al-Cu and Al-Mn for conditions of slip of the spherical indentor along a flat sample without lubrication, or for an insert-roller system. Alloying elements most effectively influence the wear resistance of alloys within the range of limited solid solutions when approaching the point of critical solubility. Author (GRA)

N72-10447# General Electric Co., Cincinnati, Ohio. Material and Process Technology Labs.

STRENGTHENING OF Fe-Cr-Al-Y OXIDATION RESISTANT ALLOYS Final Report, 1 Jan. - 31 Dec. 1970

R. E. Allen 25 Jan. 1971 59 p refs
(Contract N00019-70-C-0232)
(AD-727589) Avail: NTIS CSCL 11/6

An investigation of oxide dispersion strengthening of oxidation resistant Fe-Cr-Al-Y alloys was conducted using both coarse and fine metal powder approaches. The most successful method involved preoxidizing and extruding coarse atomized powders. A detailed thermomechanical process (TMP) study of this material showed that 2000F tensile and stress rupture properties varied widely with rolling-heat treating schedules. Yield and tensile strengths at 2000F were found to increase with increasing volume fraction of oxide and with increasing rolling reduction, but were quite insensitive to grain size. Alloys with up to 4v/o oxide had good ductility. Rupture life at 2000F was found to increase with increasing grain size. Both static and dynamic oxidation testing was conducted. Static cyclic oxidation resistance was found to be equivalent to the base alloy without oxides, and 2100F/Mach 1/1 hour cyclic exposure did not accelerate oxidation kinetics. Author (GRA)

N72-10448# Army Foreign Science and Technology Center, Charlottesville, Va.

INFLUENCE OF DIFFUSION OF LIQUID METAL INTO SOLID METAL ON ADSORPTION REDUCTION IN STRENGTH [VLIYANIYE DIFFUZII ZHIDKOGO METALLA V TVERDYY NA PROYAVLENIYE ADSORBTSIONNOGO PONIZHENIYA PROCHNOSTI]

N. V. Pertsov, N. I. Ivanova et al 21 Jul. 1971 8 p refs Transl. into ENGLISH from Fiz.-Khim. Mekhan. Materialov, Akad. Nauk Ukr. SSR (Kiev), no. 6, 1970 p 79-82
(Project T702301-2301)
(AD-727685; FSTC-HT-23-1027-71) Avail: NTIS CSCL 11/6

The work reports on a study of the diffusion of adsorption-active metal melts and the influence of diffusion on the strength of the solid metal. The studies are based on observation of diffusion of mercury into zinc. The regularities observed in the rupture of zinc monocrystals are fully reproduced in the testing of polycrystalline zinc, the strength of which is reduced by preliminary diffusion of mercury. Author (GRA)

N72-10449# IIT Research Inst., Chicago, Ill.

FATIGUE PROPERTIES OF INVESTMENT CASTINGS

William F. Shaw, Thomas Watmough, Robert P. O'Shea, J. Dorcic, and J. Staschke Rock Island, Ill. Army Weapons Command Apr. 1971 22 p
(Contract DAAF01-69-C-0558)
(AD-727659; IITRI-B6096-4; AMSWE-RE-71-2; AMS-4930.16.6493) Avail: NTIS CSCL 11/6

Large numbers of investment castings are being utilized as components in weapons. Because of the precision of these castings, many of the surfaces exposed to fatigue stresses are cast surfaces. The material studied was an AISI 4140 steel in both the cast and forged condition. Results established that the endurance ratio for the forged material in tension-tension fatigue is 0.54 while the potential ratio for the equivalent cast material is 0.47, very close to that of the forged alloy. Also, the presence of an oxide surface condition, designated as oxide folds, could lower this ratio to as low as 0.24, depending on the severity of these folds. The oxide folds were generally influential enough to mask any effects that surface finish, decarburization, or defects resulting from refractory inclusions might have on fatigue. The work has suggested that process modifications which minimize the oxide film condition will permit the potential endurance ratio to be realized. The addition of a reducing agent to the investment molds is one method noted in this work. Additionally, the work suggested that improvements in endurance ratio in castings which have oxide folds on the surface may also be achieved by abrasive blasting. Fatigue data on investment castings, previously unavailable, have been generated for use in design applications, and the conditions affecting fatigue properties of the castings have been more clearly delineated. Author (GRA)

N72-10450# Air Force Systems Command, Wright-Patterson AFB, Ohio.

EFFECT OF PRELIMINARY DEFORMATION ON THE PLASTICITY OF ALUMINUM

B. I. Bok, Ye. A. Dzhanbusinov, and A. A. Presnyakov 19 Feb. 1971 13 p refs Transl. into ENGLISH from Vestn. Akad. Nauk Kaz. SSR (Alma-Ata), v. 26, no. 2, 1970 p 53-57
(AF Proj. 1368)
(AD-724970; FTD-HT-23-44-71; UR/0031-70-026-002) Avail: NTIS CSCL 11/6

The article deals with the experimental detection of the dependence of the plasticity of Al on the degree of preliminary deformation. Tests were conducted with cold-rolled specimens deformed by 0-80 percent; plasticity was determined in the 20-600 degrees centigrade range. The experimental data confirm that the superplastic effect due to the stabilization process, observed in metastable eutectics and eutectoid alloys, is reflected by an analogous phenomenon in pure metals. Author (GRA)

N72-10451# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RESISTANCE TO ABRASIVE WEAR OF CHROMIUM ALLOYS WITH ADDITIONS OF CARBIDE-FORMING ELEMENTS

V. S. Popov and P. L. Nagornyi 8 Jan. 1971 11 p refs Transl. into ENGLISH from Tekhnol. Organ. Proizvod. (Ukrainian SSR), no. 6, 1969 p 39-41
(AF Proj. 7343)
(AD-724985; FTD-HT-23-823-70; UR/0418-69-000-006) Avail: NTIS CSCL 11/6

The wear resistance of the chromium alloys in the process of pressing refractory parts was investigated. The presence of a large amount of coarse primary chromium carbides requires a greater expenditure of alloying elements, which in turn weakens the base and lowers the resistance to wear. The wear resistance can be improved by the presence of other carbides in amounts sufficient to ensure uniform distribution of all the structural components. GRA

N72-10452# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CHANGE IN THE TECHNOLOGY OF SMELTING BALL-BEARING STEEL IN ELECTRIC-ARC FURNACES

Yu. A. Gudim, D. Ya. Povolotskii, N. V. Keis, and V. N. Lyubimov 29 Jan. 1971 12 p refs Transl. into ENGLISH from Met. Gornorudn. Prom. (USSR), v. 60, 1969 p 13-16
(AF Proj. 7343)
(AD-724987; FTD-HT-23-885-70) Avail: NTIS CSCL 11/6

The purpose of this study was to decrease the reduction period (which took 90-100 min) when melting steel ShKh15 in electric arc furnaces of small and medium capacities (10-40 tons). Samples for O and nonmetallic inclusion determinations were taken at the end of oxidation period, at the start, middle, and end of reduction period, and from the ladle after tapping. Steel was deoxidized with 75 percent Fe-Si and Al (0.4 Kg-ton). The metal was deoxidized under white slag. The slag was deoxidized with coke powder Fe-Si and Al (10 min before tapping). Al (0.5 Kg-ton) was added to the metal just prior to tapping. Significant elimination of O and S occurred during the first 40-60 min of the reduction period; however, holding the steel under white slag was ineffective. Decrease of the reduction period by 25-30 min (to 60-70 min) did not deteriorate the quality of steel ShKh15, provided the deoxidation was intensified during the rest of the reduction period. Author (GRA)

N72-10453# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STRUCTURE AND MECHANICAL PROPERTIES OF FINE-GRAIN FORMED BERYLLIUM

I. I. Papirov and G. F. Tikhinskii 29 Jan. 1971 10 p refs Transl. into ENGLISH from Fiz.-Met. i Metalloved. (Moscow), v. 29, no. 5, 1970 p 1057-1060
(AF Proj. 7351/735104)
(AD-724988; FTD-HT-23-888-70) Avail: NTIS CSCL 11/6

The method of programmed different-direction deformation of 99.9 percent pure cast beryllium was used to obtain metal with a grain size of 13 mu m. Its mechanical properties under tension were determined in the 20-1000 degrees centigrade region. At room temperature the tensile strength equalled 56.5 kgf/sq. mm and the relative elongation was 7.5 percent. At the moment of compression testing strength reached 150 kgf/sq.

mm; there was no destruction at a deformation of approximately 50 percent. Author (GRA)

N72-10454# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE NATURE OF THE CHANGE IN STRENGTH OF CERTAIN MATERIALS DURING CREEP

B. S. Shulginov and V. K. Lukashov 5 Feb. 1971 9 p Transl. into ENGLISH from Ternoprochnost Materialov i Konstrukt. Elementov Sbornik (USSR), no. 5, 1969 p 101-104
(AF Proj. 1368)
(AD-725006; FTD-HT-23-39-71) Avail: NTIS CSCL 11/6

Test procedures, special equipment, and test results from research on the change in stress-rupture and tensile strength of steel 1Kh18N9T and the Al-alloy D16T are described. It was established that during creep softening of the material proceeds according to a complex law. Intensive softening occurs at the beginning and at the end of the creep; the intermediate period of creep is characterized by virtually stable strength values. The possibility of sudden failure under overload of certain materials subjected to prolonged subcritical steady-state loading is demonstrated. Author (GRA)

N72-10455# Air Force Systems Command, Wright-Patterson AFB, Ohio.

SPECIAL FEATURES OF DEFORMATION AND THE MECHANICAL PROPERTIES OF NICKEL/TITANIUM COMPOSITES REINFORCED WITH TUNGSTEN WIRE

Ch. V. Kopetskii, A. M. Markov, and V. L. Orzhekhovskii 12 Feb. 1971 20 p refs Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 1, 1970 p 70-78
(AD-724996; FTD-HT-23-43-71) Avail: NTIS CSCL 11/4

The article presents results of research on deformation, hardening, and softening of model composites based on nickel and the titanium alloy VTZ-1, reinforced with tungsten wire. The temperature dependence of the mechanical properties was studied and the macromechanism of deformation and destruction of components was examined as a function of the volume fraction of the fiber. Author (GRA)

N72-10456# Naval Air Development Center, Johnsville, Pa. Aero Materials Dept.

FATIGUE CRACK GROWTH BEHAVIOR FOUR HIGH STRENGTH STEELS IN TWO HUMID ENVIRONMENTS, PART 1

C. E. Neu and A. R. Fletcher 29 Jan. 1971 30 p refs
(AD-725470; NADC-MA-7060; F51-541-201) Avail: NTIS CSCL 11/6

Fatigue crack growth rates (da/dN) as a function of applied stress intensity amplitude (delta K) were determined for four high strength steels (HP 9-4-.45, 18% Ni marage 250, D6Ac, AISI 4340) in air at 10 percent and at 80 percent relative humidities (R.H.). All four steels demonstrated sensitivity to high humidity with crack growth rates in 80 percent R.H. air being one and one-half to two times as high as in 10 percent R.H. air. Overall crack growth rates of three steels, HP 9-4-.45, 18% Ni marage 250, and D6Ac, were similar, while rates for AISI 4340 were uniformly higher than those of the other three steels. Author (GRA)

N72-10457# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.

AN APPLICATION OF FRACTURE CONCEPTS TO THE PREDICTION OF CRITICAL LENGTH OF FATIGUE CRACKS. PART 3: A UNIFIED THEORY FOR FRACTURE OF METAL AND ALLOYS M.S. Thesis - Ohio State Univ., 1970. Techical Report, Jun. 1969 - Jun. 1970

Sidney O. Davis Apr. 1971 87 p refs
(AD-725752; AFML-TR-70-202-PT-3) Avail: NTIS CSCL 11/6

A thermodynamic energy approach is used to develop a unified theory of fracture relative to mechanical response of metals and alloys as a function of the atomic, and metallurgical structures and the phenomenological aggregate levels collectively. Fracture (stable cracking) and fracture dynamics (unstable cracking) are correlated in terms of the theory based upon the process of energy transformation and in terms of mechanical and thermal energy of the First Law of Thermodynamics. Author (GRA)

N72-10458# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.

SOME OBSERVATIONS PERTAINING TO SIMPLE FRACTURE TOUGHNESS SCREENING TESTS FOR TITANIUM

T. M. F. Ronald, J. A. Hall, and C. M. Pierce Mar. 1971 38 p refs
(AF Proj. 7351)
(AD-725750; AFML-TR-70-311) Avail: NTIS CSCL 11/6

While the K(Ic) value of a material is a very useful measure of fracture toughness, its valid experimental determination can be a complex and expensive procedure, not at present suited to routine alloy screening or quality control purposes. To explore the feasibility of estimating K(Ic) in titanium alloys using techniques that are more convenient to perform, impact and slow-bend tests were made on wither V-notched or fatigue-precracked Charpy specimens, and the resulting energy values were compared with the corresponding approximate K(Ic) values. Results from five titanium-based alloys and two steels showed that precracked specimens broken in slow bend gave energy values that could be related to K(Ic) in a straightforward manner. The best correlation between energy and K(Ic) came from specimens having mostly flat fractures, but in the higher toughness cases, where shear lips of an appreciable size were formed, just as reasonable a relationship between energy and K(Ic) was observed when flat fracture energies were used. Author (GRA)

N72-10459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF POWDER METALLURGY TO AN ADVANCED-TEMPERATURE NICKEL-BASE ALLOY, NASA-TRW 6-A

John C. Freche, Richard L. Ashbrook, and William J. Waters Washington Nov. 1971 23 p refs
(NASA-TN-D-6560; E-6490) Avail: NTIS CSCL 11F

Bar stock of the NASA-TRW 6-A alloy was made by prealloyed powder techniques and its properties evaluated over a range of temperatures. Room temperature ultimate tensile strength was 1894 MN/sq m (274 500 psi). The as-extruded powder product showed substantial improvements in strength over the cast alloy up to 649 C (1200 F) and superplasticity at 1093 C (2000 F). Both conventional and autoclave heat treatments were applied to the extruded powder product. The conventional heat treatment was effective in increasing rupture life at 649 and 704 C (1200 and 1300 F); the autoclave heat treatment, at 760 and 816 C (1400 and 1500 F). Author

N72-10460 National Lending Library for Science and Technology, Boston Spa (England).

ELECTROLYTIC PRODUCTION OF MAGNESIUM FROM CARNALLITE, DEHYDRATED IN A FLUIDIZED BED

I. L. Reznikov, T. K. Dolgikh, and T. S. Sheka 22 Sep. 1971 15 p refs Transl. into ENGLISH from Tsvetn. Metal. (USSR), v. 42, no. 10, Oct. 1969 p 52-56
(NLL-Trans-1173-(9022.9)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Prolonged (190-day) tests were carried out on an industrial electrolyzer fed with solid carnallite, in order to determine the influence of residual water upon the current efficiency and other characteristics of the process of electrolysis. The results supported the fact that a significant part of MgO in the electrolyzer (incrustations, etc.) is chlorinated without a reducing agent. For continuous charging of dehydrated carnallite into the electrolyzer, it is possible to increase the degree of chlorination of magnesium oxide without a reducing agent and to diminish wear on the anodes. The changeover to solid charging permits the substantial reduction of electrical energy in the production of magnesium from carnallite and the increase in productive capacity of the electrolyzers. But the service life of the anodes is significantly reduced and the quality of the chlorine is impaired. Author

N72-10461 National Lending Library for Science and Technology, Boston Spa (England).

DETERMINATION OF LIMIT OF SOLUBILITY OF TUNGSTEN IN SOLID SOLUTIONS OF Ni-Cu IN W-Ni-Cu SYSTEM

I. N. Chaporova and V. M. Agababova 2 Sep. 1971 5 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metal. (USSR), no. 5, 1970 p 205-207 In RUSSIAN and ENGLISH
(NLL-TRANS-746-810-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

In order to determine the solubility limit of tungsten in the solid solution, (Ni, Cu) W alloys were prepared by sintering and by melting. The make-up of the alloys ranged from 40:60 ratio of nickel and copper to an 80:20 ratio; the amount of tungsten varying from 0 to 25%. The investigations of the microstructure of the melted samples show that, in the alloys not containing tungsten, the boundaries of the polyhedrons of the solid Ni-Cu solution have traces of dendrite liquefaction. Both the single phase and double phase W-Ni-Cu alloys are characterized by sharply defined dendrite liquefaction of the solid solution (Ni, Cu) W, which is clearly exposed after etching. Investigation of the structure of the alloys obtained by sintering show that the single phase samples have a polyhedral structure of the gamma-solid solution. In determining the solubility limit of tungsten, the results show that in the gamma-solid NiCu solution, the solubility decreases from 21% at 1200 C and 19% at 1100 C (ratio of Ni:Cu = 80:20) to 3% and 1% respectively at a ratio of Ni:Cu = 40:60, with an increase in the copper content of the alloy. D.L.G.

N72-10462 National Lending Library for Science and Technology, Boston Spa (England).

CALCULATION OF DIFFUSION EFFECTS IN MOLTEN METALS

A. V. Kaibichev and B. M. Lepinskikh 2 Sep. 1971 5 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metal. (USSR), no. 4, 1970 p 205-208 In ENGLISH and RUSSIAN
(NLL-TRANS-746-897-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method is proposed for calculating distribution of the diffusing element due to convective and molecular diffusion in a semi-infinite capillary tube. The method permits the conditions of the experiment to be selected, and is used in determining the coefficients of molecular diffusion in molten metals. E.M.C.

N72-10463 National Lending Library for Science and Technology, Boston Spa (England).

PECULIARITIES OF DEFORMATION AND MECHANICAL PROPERTIES OF NICKEL AND TITANIUM-BASE COMPOSITES, REINFORCED WITH TUNGSTEN WIRE

C. V. Kopetskii, A. M. Markov, and V. L. Orzhekhovskii 2 Sep. 1971 10 p refs Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 1, 1970 p 70-78 In ENGLISH and RUSSIAN
(NLL-TRANS-746-840-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The results of investigations of deformation, hardening and fracture of model composites of nickel and titanium VT3-1 alloys, reinforced with tungsten wire, are given. The temperature effect on the mechanical properties was studied and the macro-mechanism of deformation and fracture of the components as a function of the proportion of the wire was described. The difference in properties and possibility of their comparatively wide regulation in metallic composites has been specified recently by the great interest paid to this group of promising materials. Important problems, such as devising principles for fabricating the composites, the optimum technological processes obtained, and finally the mechanism of deformation and the basic factors determining the mechanical properties are discussed. Author

N72-10464 National Lending Library for Science and Technology, Boston Spa (England).

THE EFFECT OF NEUTRON IRRADIATION ON THE MECHANICAL PROPERTIES OF 18Cr-10Ni-Ti STEEL

A. N. Lapin, V. A. Nikolaev, and I. A. Razov 2 Sep. 1971 6 p refs Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 1, 1970 p 8-13 In ENGLISH and RUSSIAN
(NLL-TRANS-746-766-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The dependence of the charge of the mechanical properties of 18Cr-10Ni-Ti steel on the integral neutron dosage ($E > 1$ Mev) and the temperature of exposure were investigated. The peculiarities in the hardening of the steel during exposure (difference in change of both stress and tensile strength, form of elongation diagram, decrease in work hardening with increase of dosage, etc.) are explained by the interaction of mobile dislocations with the complex radiation defects, and also by differences in the concentration and spectrum of the defects. This point of view is confirmed by the results of the tests obtained after tempering of the exposed steel. It is known that the radiation damage of metal is strengthened according to the degree of increase in the integral neutron dose and weakens with an increase in the temperature of exposure. Some features of radiation hardening and decrease in plasticity, which may be used to explain the mechanism of radiation damage, were noted during an investigation of the mechanical properties of 18Cr-10Ni-Ti steel after exposure to conditions of varying temperature and integral dosage. Author

N72-10465 National Lending Library for Science and Technology, Boston Spa (England).

X-RAY STUDY OF ZIRCONIUM-NIOBIUM-NICKEL SYSTEM

A. D. Evdokimova, S. M. Kuznetsova, G. N. Ronami, and E. M. Sokolovskaya 2 Sep. 1971 3 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 2 Khim. (Moscow), v. 11, no. 1, 1970 p 62-66 In ENGLISH and RUSSIAN
(NLL-TRANS-746-865-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A complete investigation was made of the ternary zirconium-niobium-nickel system by different methods of physico-chemical analysis. Isothermal sections of the phase diagram at temperatures of 800 and 500 C were constructed. It was established that the compounds of the binary zirconium-nickel system occur in reciprocal action with $NbNi_3$, Nb, and Zr. The character of the interaction of ZrNi and Zr_2Ni compounds with niobium is of the simple eutectic type. New ternary intermetallic phases in the system were not observed. The results of the X-ray microanalysis of the ternary system are given. Alloys of zirconium with niobium and nickel , preliminarily heat treated for 700 hours at 800 C and for 2000 hours at 500 C, were selected. The sections for analysis were prepared by normal mechanical polishing and were analyzed without preliminary etching. A quantitative analysis of the phases was conducted on all the samples using pure elements (zirconium, niobium, nickel) as the standard. During the determination of the concentration of the element analyzed, air was present to approximately 1-2 wt.%. Author

N72-10466 National Lending Library for Science and Technology, Boston Spa (England).

WEAR RESISTANCE AND FINE STRUCTURE AFTER THE RECRYSTALLIZATION OF PREVIOUSLY SUPERHEATED STEEL

A. A. Mukhamedov and Sh. Sh. Maksudov 1971 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), no. 4, 1971 p 102-105
(NLL-M-21092-(5828.4F); Rept-157-I) Avail: Natl. Lending Library, Boston Spa, Engl: 1 NLL photocopy coupon

The inheritance of fine structure in previously superheated types 40 Kh and 30 khGT steel was studied. It was shown that the degree of imperfection of the crystal lattice depends on the temperature of preliminary superheating of the steel. The maximum imperfection was obtained with a prior superheating temperature of 1200 C (with final tempering at 200 C). By increasing the temperature of the final tempering treatment, the peak of the maximum was displaced into the region of a lower preliminary normalizing temperature. An increased austenitizing time with repeated heating before quenching promoted recrystallization of the austenite and a decrease in the crystal lattice defects. Wear of the steel is a linear function of the physical width of the lines in the X-ray diagrams of the investigated specimens. Inheritance of the characteristics of the fine structure produces a marked variation (from 21 to 40%) in the amount of wear. Author

N72-10467 National Lending Library for Science and Technology, Boston Spa (England).

SURFACE SATURATION OF HARD, MAGNETIC, YUNDK35T5 ALLOY

V. V. Goncharova, I. G. Lyapichev, Yu. M. Byzov, Yu. V. Chesnokov, and T. N. Shtern 1971 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), vol. 14, no. 4, 1971 p 116-121
(NLL-M-21093-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The effect of the concentration of carburizing agent, boron carbide, and silicon on the depth and hardness of the surface layer is studied. By surface grinding the magnets after thermochemical treatment, the productivity of the former is increased by over 40%. Author

N72-10468 National Lending Library for Science and Technology, Boston Spa (England).

THE EFFECT OF CERIUM ADDITIONS ON THE PROPERTIES OF 20 AND 20G STEELS AFTER COLD PLASTIC DEFORMATION WITH SUBSEQUENT HEATING

I. V. Paisov and A. M. Agaev 1971 2 p Transl. into ENGLISH from Stal (Moscow), no. 5, 1971 p 474
(NLL-M-21114-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Low carbon steels were inoculated with an addition of ferrocerium in quantities of 0.080 to 0.18% following cold plastic deformation and subsequent heating. The residual stresses in the cold-worked steels were removed and the tendency to embrittlement reduced, while still maintaining the strength at its former level. Inoculated 20 and 20G type steels, following cold working with reductions of up to 60% and heating to 500 C, have a tensile strength of around 80-85 kg/sq mm, which is double their strength in the normalized condition. It is further noted that they retain a substantial reserve of impact toughness (4-8 kg/sq mm) at test temperatures of -60 to +80 C. E.M.C.

N72-10469 National Lending Library for Science and Technology, Boston Spa (England).

ULTRASONICS AS A TOOL FOR MATERIALS RESEARCH

H. U. Zbinden 22 Sep. 1971 35 p refs Transl. into ENGLISH from Technica (Basel), v. 18, 1969 p 1395-1400, 1407-1409, and 1593-1600
(NLL-CE-Trans-5421-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

The measurement of ultrasonic attenuation was shown to be suitable for determining grain size and porosity, and quantity and size of graphite in grey cast iron. Ultrasonic velocity measurement was applied to classifying the graphite formations both in grey and spheroidal graphite cast iron. The limitations and advantages of each of these techniques are discussed. Author

N72-10470 National Lending Library for Science and Technology, Boston Spa (England).

ACTIVITY AND SOLUBILITY OF CARBON IN STAINLESS CHROMIUM-NICKEL STEEL WITH APPROXIMATELY 18 PERCENT Cr AND 9 Ni

H. Tuma et al 19 Aug. 1971 13 p refs Transl. into ENGLISH from Arch. Eisenhuettenw. (Duesseldorf), v. 40, no. 9, Sep. 1969 p 727-731
(NLL-CE-Trans-5635-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The behavior of carbon and its effect on the crystalline structure and precipitation of carbide phases, as well as the nature, chemical composition, and quantity of the latter, were studied. A simple method was used to determine the equilibrium conditions for carbon. The equilibrium content of carbon was determined in specimens of stainless steel having about 18% Cr and 9% Ni and in control specimens of pure iron in a mixture of hydrogen and methane. The limit of carbon solubility in the solid solution of the steel over the temperature range 950 to 1200 C was determined, together with the precipitation limits of the carbides M23C6 and M7C3. Author

N72-10471 National Lending Library for Science and Technology, Boston Spa (England).

REVIEW OF ELECTROCHEMICAL METHODS OF STUDYING HYDROGEN EMBRITTLEMENT AND STRESS CORROSION CRACKING

L. L. Shreir 19 Aug. 1971 31 p refs Transl. into ENGLISH from Werkst. Korros. (West Germany), v. 21, no. 8, Aug. 1970 p 613-629
(NLL-CE-Trans-5660-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

In certain metal systems hydrogen embrittlement (HE) and stress corrosion cracking (SCC) are clearly distinguishable, but in others the mechanism is uncertain, and failure attributed to SCC may actually be due to HE. In certain cases it is possible that failure is due to their conjoint action. SCC and HE are compared and the various investigational techniques employed are described, with special reference to electrochemical methods. Author

N72-10472 National Lending Library for Science and Technology, Boston Spa (England).

INTERNAL STRESSES IN NICKEL ELECTRODEPOSITS

N. D. Biryukov and K. A. Siletskaya 2 Sep. 1971 5 p refs In RUSSIAN and ENGLISH
(NLL-TRANS-746-767-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method devised for reinforcing of the cathode permitted two views of the internal stresses to be established, residual and removed. The latter can be determined by two independent methods: (1) power (determining the force expended on the contraction of the strip) and (2) deformation (means of calculating the contraction of the samples according to the size of delta). It was established that the removed stress is not subjected to Hooke's law and is linked with the transverse contraction of the nickel deposit. The results of the determination of stresses in nickel, deposited electrolytically on copper and nickel foil are shown. A contraction of the copper strip was noted during the deposition of nickel. At this, in any moment of the deposition, equilibrium is established: stress, opposing contraction, arises in copper, and the tensile stress, maintaining the system in equilibrium, remains in nickel. Author

N72-10473 National Lending Library for Science and Technology, Boston Spa (England).

SOME PHYSICO-CHEMICAL PROPERTIES OF ELECTROLYTIC Ni-Ti ALLOYS

J. Bubelis, G. Kadziene, and J. Matulis 2 Sep. 1971 6 p refs Transl. into ENGLISH from Liet. TSR Mokslu Akad. Darbai, Ser. B (Lithuania), v. 61, no. 2, 1970 p 75-81 In RUSSIAN and ENGLISH
(NLL-TRANS-746-878-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

An X-ray analysis method is used to analyze alloys containing from 4% to 6% Ti, and to show that there is a mechanical mixture of Ni and a substitution solid solution of Ti in Ni. Also discussed are the degree of hydrogenation, the mechanical properties, and the corrosion resistance of electro-coatings by Ni-Ti alloys, obtained from electrolytes with complex forming additions. Author

N72-10474 National Lending Library for Science and Technology, Boston Spa (England).
HEAT AND MECHANICAL TREATMENT AND OTHER METHODS OF IMPROVING THE STRENGTH OF STRUCTURAL STEELS
A. I. Grishkov and F. L. Levin 1971 5 p Transl. into ENGLISH from Stal (Moscow), no. 5, 1971 p 457
(NLL-M-21107-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The principal trends in the production of high strength steels are considered. The method with the best prospects is heat and mechanical treatment, which yields tensile strengths up to 200-300 kg/sq mm. Other methods such as deformation of martensite during hydro-extrusion and production of particularly fine-grained austenite are being developed. The difficulties involved in the practical use of high strength steels are noted. Author

N72-10475 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF THE DEGASSING OF METALS BY THE FLOW METHOD
L. A. Andreev and B. G. Gelman 1971 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 5, 1971 p 19-22
(NLL-M-21118-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A new variant of the flow method is described for the study of the kinetics of removing and analyzing small quantities of hydrogen in which an IPDO-1 omegatron partial pressure measuring device is used as the source. A method is examined for the quantitative analysis of degassing curves to determine the kinetic parameters of the process. The results obtained with the method for studying the evolution of hydrogen from aluminium are described. Author

N72-10476 National Lending Library for Science and Technology, Boston Spa (England).
EFFECTS OF HEAT TREATMENT ON THE PHASE COMPOSITION AND STRUCTURE OF 47KhNM STEEL
S. S. Potapova, I. Ya. Sokol, and Ya. L. Frid 1971 3 p Transl. into ENGLISH from Stal (Moscow), no. 5, 1971 p 466
(NLL-M-21112-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The structure of 0.2-2.5 mm thick alloy strip after quenching from 1150-1250 C and aging at 700 C was studied. The structure after quenching from 1200-1250 C is basically austenite. Author

N72-10477 National Lending Library for Science and Technology, Boston Spa (England).
INFLUENCE OF VACUUM MELTING ON THE PROPERTIES OF ALLOYS FOR INDUSTRIAL SPRINGS
V. A. Solts, A. S. Hdanova, M. M. Knoroz, B. N. Popv, and N. M. Federov [1971] 10 p refs Transl. into ENGLISH from Stal (USSR), no. 4, 1971 p 357-360
(NLL-M-21079-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The effect of vacuum melting on the properties of alloys for industrial springs is discussed. Melting of cobalt-chrome-nickel base spring alloys 40KKhNM and 40KNKhMVTYu in vacuum induction furnaces has little influence on mechanical properties (only the elasticity properties increase slightly). The ductility of the strip and the endurance (number of cycles to failure) of industrial springs made from vacuum melted alloys are much higher than observed in alloys melted in open induction furnaces and subjected to the same subsequent treatment. Author

N72-10478 Stanford Univ., Calif.
PHOTOEMISSION AND OPTICAL STUDIES OF COPPER-NICKEL ALLOYS Ph.D. Thesis
David Henry Seib 1970 222 p
Avail: Univ. Microfilms Order No. 70-18474

Photoemission and reflectivity data are presented and discussed for pure Cu, pure Ni, and seven different Cu-Ni alloys spanning the entire composition range. Photoemission data was obtained over the photon energy range from about 5 eV to 11.6 eV. The reflectivity data was used to obtain information about the electronic densities of states in the alloys and the deduced electronic structure was in turn related to other properties (magnetic, electronic specific heat, etc.) of Cu-Ni alloys. Virtual bound state parameters for Ni d states in Cu were deduced from the photoemission data and the effects of increasing Ni concentration on the Ni d states density were examined. In Cu rich alloys, structure due to the Cu d states was found to be little different from that in pure Cu. The density of electronic states in Ni rich alloys containing up to about 20% is found to be relatively unchanged from that of pure Ni. In alloys with greater Cu concentration, the Cu d states are identified at energies 2 to 3 eV below the Fermi energy. Dissert. Abstr.

N72-10479 California Univ., Berkeley.
THE MICROMECHANICS OF FRACTURE OF PEARLITIC STRUCTURAL STEELS Ph.D. Thesis
Peter John Guest 1969 155 p
Avail: Univ. Microfilms Order No. 70-17483

Few quantitative investigations studying fracture and the related fracture properties of hot rolled ferrite-pearlite structural steels were made. A mechanical and metallurgical analysis was carried out on the pearlitic, martensitic, and spheroidized carbide structures of plain carbon hypoeutectoid steels in the temperature range -320 F to +150 F. The quantitative measurement of the microcharacteristics associated with cleavage fracture determined by the use of the stress wave emission technique, which essentially monitors the elastic wave produced by discontinuous crack movements. The measured mechanical properties were correlated with information obtained from optical and scanning electron microscopy techniques. The analysis shows that as the volume fraction of pearlite is increased from 0 to 1, the plane strain fracture toughness decreased by 65% at +70 F and by 61% at -320 F. Dissert. Abstr.

N72-10480 California Univ., Berkeley.
THE EFFECT OF STACKING FAULT ENERGY ON THE STRAIN INDUCED MARTENSITE TRANSFORMATION AND TENSILE CHARACTERISTICS IN IRON BASED ALLOYS Ph.D. Thesis
John Stanley Dunning 1969 124 p
Avail: Univ. Microfilms Order No. 70-17548

Two series of iron based alloys, one carbonless the second containing carbon were designed such that a regular variation of stacking fault energy (S.F.E.) in the range 10 to 50 ergs cm/2 was obtained while maintaining a constant temperature within each series. The austenitic alloys were transformed to martensite under the influence of tensile strain at cryogenic temperatures. Transformation characteristics were found to vary in a consistant fashion within each series of alloys. In alloys with high S.F.E. the martensite formed during tensile straining formed in massive blocks or large fragmented plates. In low S.F.E. alloys, however, the transformation products observed were extremely fine. In the carbonless series of alloys the presence of epsilon - (hcp) phase was detected together with alpha - (bcc) martensite after transformation, in the alloy with lowest stacking fault energy. The effect of prior deformation on subsequent strain induced transformation varied considerably between the two alloy series. Dissert. Abstr.

N72-10481 Drexel Inst. of Tech., Philadelphia, Pa.
AN INVESTIGATION OF THE HOMOGENIZATION PROCESS IN TWO-PHASE BINARY ALLOYS Ph.D. Thesis
Richard Anthony Tanzilli 1970 160 p

Avail: Univ. Microfilms Order No. 70-19731

Quantitative experimental and analytical methods were developed for studying the two-phase, binary homogenization process was established initially using finite-boundary, Ag-Cu and Ni-W diffusion couples. Interphase boundary displacements and electron microprobe concentration measurements compared favorably with analytic predictions. The modeling approach was extended to the more complex particulate geometry associated with metallurgy fabrication. Quantitative metallography and X-ray compositional line broadening were used to follow the Ni-W powder homogenization process. Dissert. Abstr.

N72-10482 California Univ., Berkeley.

INTERSTITIAL ORDERING AND MECHANICAL PROPERTIES OF TANTALUM-CARBON ALLOYS Ph.D. Thesis

Prakash Rao 1969 126 p

Avail: Univ. Microfilms Order No. 70-17643

Small concentrations of interstitial solutes (carbon, oxygen, nitrogen, and hydrogen) in the Group VB body centered cubic metals (vanadium, niobium and tantalum) undergo interstitial ordering, whereby preferential occupation of one type of interstitial site leads to the formation of a regular periodic distribution of interstitial atoms forming superlattices. Direct evidence for interstitial ordering in the tantalumcarbon system is obtained by transmission electron microscopy and field ion microscopy and is correlated with data on mechanical properties. Transmission electron microscopy indicates that the ordering transformation begins by fine scale fluctuations in carbon composition associated with the /110/ planes. The fully ordered structure is realized locally when regions of ideal wavelength are obtained. The alloy can be considered then to contain small ordered particles.

Dissert. Abstr.

N72-10483 California Univ., Berkeley.

THE INITIAL STAGES OF ORDERING IN THE ALLOY Ni4Mo Ph.D. Thesis

Paul Rokuro Kamoto 1969 132 p

Avail: Univ. Microfilms Order No. 70-17629

Transmission electron and field ion microscopy techniques were used to study the nature of short range order (SRO) in as-quenched NI4Mo and the changes which occur during the very initial stages of the transition to the long range ordered state. Field ion images of both as quenched and alloys aged for very short times below 750 C show a strong tendency for clustering of well defined groups of atoms about the <420> fcc poles. The electron diffraction patterns of the as-quenched alloy exhibits both sharp 1 1/2 O SRO spots and very weak satellites near superlattice positions. A diffraction model based on this idea explains not only the 1 1/2 O SRO intensity maxima but also the presence of the weak satellites near superlattice positions. The model is also compatible with the FIM results and suggests that the bright well defined groups of atoms correspond to planes possessing a high Mo'concentration. Dissert. Abstr.

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N72-10484# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Ferrites Hyperfrequences.

STUDY OF GRANULAR STRUCTURE AND ITS EFFECT ON CERTAIN PHYSICAL AND MAGNETIC PROPERTIES OF FERROMAGNETIC POLYCRYSTALLINE MATERIALS Final Report [ETUDE DE LA STRUCTURE GRANULAIRE ET DE SON INFLUENCE SUR CERTAINES PROPRIETES PHYSIQUES ET MAGNETIQUES DE MATERIAUX FERRIMAGNETIQUES POLYCRISTALLINS RAPPORT FINAL]

J. Nicolas and M. Hildebrandt Dec. 1970 46 p refs In FRENCH Sponsored by Delegation Gen. a la Rech. Sci. et Tech.

Avail: NTIS

Three different ferromagnetic garnets (yttrium-iron, yttrium-gadolinium, and yttrium-aluminum) were prepared by hot pressing at 1200 C. They were heat treated at temperatures in the range from 1250 to 1400 C in order to increase the size of the crystals (activitation energy 85 Kcal). In some cases this treatment led to a large decrease in the thickness of the resonance line without any increase of the crystal size which remained in the micron range, nor of the porosity which remained in the percent range. ESRO

N72-10485# Army Foreign Science and Technology Center, Charlottesville, Va.

ON STRUCTURAL FORMATION OF CARBON CONTAINING FIBERS BY PYROLYSIS

I. N. Ermolenko and R. N. Sviridova 13 Jul. 1971 10 p refs Transl. into ENGLISH from Akad. Nauk Belorussk. SSR, Ser. Khim. (USSR), no. 6, 1969

(Project T702301-2301)

(AD-727341; FSTC-HT-23-925-71) Avail: NTIS CSCL 11/5

The absence of satisfactory information in regard to the effects of a number of factors on the properties of the fibers produced by pyrolysis and lack of knowledge related to complex chemical processes occurring during pyrolysis, also lack of understanding in regard to structure of the carbonized fibers, prevent the manufacture of fibers with desirable properties and also hinder the development of optimum conditions for their synthesis. The work is devoted to the development of methods for the production of carbonized fibers with improved properties, and also to the study of the effects of a number of important factors on the structure of carbonized fiber. A method suggested earlier in the manufacture of fibers consists of pyrolysis of cellulose fiber, which is modified in advance chemically. This leads to an increase in yields of the product, improves the properties of the product, and insures introduction into the modified fiber of some metals, which in turn opens up wide possibilities in process control and permits the manufacture of a wide range of products with various useful properties (3,4). The fibers manufactured using this method are the subject of this research study. Author (GRA)

N72-10486# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

WEAR RESISTANCE OF REINFORCED SLIDING BEARINGS MADE OF EPOXY COMPOSITIONS

V. G. Tverdokhleb and N. F. Kuzmin 8 Jan. 1971 11 p refs Transl. into ENGLISH from Tekhnol. Organizatsiya Proizvodstva (Moscow), no. 5, 1969 p 31-33

(AF Proj. 7343)

(AD-727466; FTD-HT-23-821-70) Avail: NTIS CSCL 13/9

Results are given of an investigation of the wear resistance of reinforced sleeve bearings made of epoxy compositions in the absence of lubrication, as well as with lubrication by mineral oil. By means of tests made on stands and in production, it is established that reinforced bearings produced by the winding method are distinguished by high wear resistance and efficiency in comparison to bearings made of bronze, capron and polyamide resin 68. Author (GRA)

N72-10487# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

NEW TRENDS IN DEVELOPING SUPERSTRONG AND HEAT-RESISTANT MATERIALS

I. N. Frantsevich 28 May 1971 12 p refs Transl. into ENGLISH from Prom. Armenii (USSR), v. 12, no. 1, 1969 p 10-12

(Project FTD-6010703)

(AD-727165; FTD-HT-23-222-71; DIA-T68-01-02) Avail: NTIS CSCL 11/2

The authors discuss the new method of synthesizing dispersion-strengthened compositions (pseudoallys), p heterogeneous structures synthesized from nonalloying components, where the dispersion phases serve as the component which regulates and optimizes the properties of the matrix medium. Damping of dislocations by dispersion particles of such components is discussed and equations are given. Author (GRA)

N72-10488# Naval Air Development Center, Johnsville, Pa. Aero Materials Div.

CORROSION INHIBITING PRIMERS FOR ALUMINUM ALLOYS

A. I. Falkowitz 30 Jun. 1971 19 p
(Project WF51-543-202)
(AD-727594; NADC-MA-7106) Avail: NTIS CSCL 11/3

The purpose of this investigation was to develop an epoxy primer which would be superior to the MIL-P-23377B epoxy primer for protecting aluminum against corrosion. Epoxy primers which contain high amounts of leachable chromate pigments ($SrCrO_4$, or $SrCrO_4$ & $CaCrO_4$) were found to afford better corrosion protection for aluminum than the specification epoxy primer. However, the former tend to blister more in water than the specification primer when topcoated with either the MIL-C-22750 epoxy or the MIL-C-81773(AS) polyurethane topcoats. Epoxy primers made with a high pigment content of zinc chromate pigment gave the best corrosion protection for aluminum. However, these primers, when topcoated with either epoxy or polyurethane and dried for several days at about 75F and 75% RH, tend to fail intercoat adhesion in the wet tape test. Author (GRA)

N72-10489# Naval Air Development Center, Johnsville, Pa. Aero Materials Div.

DEVELOPMENT OF A STRESS CRACK RESISTANT URETHANE SEALANT FOR HEATED AREAS OF AIRCRAFT SURFACES

A. Stander Jul. 1971 15 p refs
(Project WF51.543.202)
(AD-727592; NADC-MA-7139) Avail: NTIS CSCL 11/1

A sprayable urethane sealant, AMD-P-28A was developed for protection of exterior fastener areas. This sealant in laboratory testing does not crack around fastener heads during -60F cyclic fatigue loading (1,000-11,000 lbs.) even after a heating of 20 hours at 260F plus one hour at 325F, which simulates the frictional heating of F14A aircraft during a single PAR cycle. Author (GRA)

N72-10490# Army Foreign Science and Technology Center, Charlottesville, Va.

NON-METALLIC PROTECTIVE COVERINGS

V. M. Pokrovskii 30 Jul. 1971 78 p refs Transl. into ENGLISH of the publ. "Nemetallicheskiye Zaschitnyye Pokrytiya" Kiev, Budivelnik, 1969 p 2-107
(Project T702301-2301)
(AD-727684; FSTC-HT-23-651-71; ACSI-J-9740) Avail: NTIS CSCL 11/3

The report summarizes the experiences gained in organizing an implementing quality control of non-metallic protective coverings as practiced in the construction of facilities within the metallurgical, chemical, mining, machine construction, light and food processing industries. A detailed description is offered of the methods used in determining the qualitative indexes of protective coverings. Special attention is directed to defects found in lacquer, rubberized, ceramic and polymer coverings, as well as to the methods used in eliminating them. Consideration is given to problems dealing with the improvements of quality of coverings and in perfecting quality production controls. As a practical manual it is intended for the use of engineer and technician personnel who are involved in the handling and use of protective coverings, as well as for foremen, specialists, and engineers directly involved in this work. Author (GRA)

N72-10491# Army Foreign Science and Technology Center, Charlottesville, Va.

HARDENING OF UNSATURATED POLYESTER RESINS UNDER THE INFLUENCE OF CUMENE HYDROPEROXIDE [OTVERZHEDENIYE NENASYSCHENNYKH POLIETIRNYKH SMOL POD DEYSTVIYEM GIDROPEREKISI DUMOLA]

I. M. Alshits and N. M. Grad 30 Jul. 1971 12 p refs Transl. into ENGLISH from Vysokomolekul. Soedin. (Moscow), v. 11, no. 12, 1969
(Project T702301-2301)
(AD-727499; FSTC-HT-23-679-71; AUSI-J-9847) Avail: NTIS CSCL 11/9

Results of a comparative study are presented on the properties of copolymers of polyethylene glycol maleate adipate with styrene, hardened by two initiator systems. Author (GRA)

N72-10492# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

REDUCTION IN THE GAS PERMEABILITY OF PLASMA COATINGS

L. N. Usov, A. I. Borisenko, I. M. Grogoreva, and E. M. Trusova 1 Mar. 1971 12 p refs Transl. into ENGLISH from Proceedings of 4th All-Union Conf. on Fire-Proof Coatings, Leningrad, 27-31 Mar. 1968
(AF Proj. 1426)
(AD-727906; FTD-MT-24-348-70) Avail: NTIS CSCL 11/3

The article deals with means of reducing the gas permeability of sprayed coatings. A couple of methods of obtaining gas permeable coatings included in this article are: treating a sprayed coating with an agglomeration activator and saturating it with organic compounds or glass that polymerize or fuse; introducing into the basic composition components that form hard bondings and generate considerable amounts of heat, and glasslike components having a characteristic interval of ductility during cooling. Author (GRA)

N72-10493# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE EFFICIENCY OF THE VNIL NP-213 SOLID LUBRICATING COATING

G. V. Kurilov, L. N. Sentyurikhina, I. M. Lyubarskiy, and V. F. Udovenko 27 Jan. 1971 14 p refs Transl. into ENGLISH from Khim. i Tekhnol. Topliv i Masel (Moscow), v. 15, no. 3, 1970 p 49-53
(FTD Proj. 7343)
(AD-724975; FTD-MT-24-278-70; UR/0065-70-015-003) Avail: NTIS CSCL 11/8

The report gives experimental investigations of the service life and friction coefficient of a solid lubricating coating (not further specified), but appearing to contain molybdenum disulfide and silicon as a function of the load, sliding rate and vacuum level. Tests were performed with a film (20 microns) deposited on the surfaces of a sliding contact at a pressure of 2 atm. The efficiency of the coating at high-temperatures in air was also studied. It was found that the friction coefficient decreases with increasing load both in dry and humid air and in vacuum. At high sliding rates and high loads, the temperature and friction coefficient increase and the service life decreases. In vacuum, the service life is 4 to 6 hr at a relative humidity of 50 to 70 percent and 13 to 14 hr in dry air. Author (GRA)

N72-10494# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SYNTHESIS AND STUDY OF A SULFUR- AND PHOSPHORUS-CONTAINING MULTIPURPOSE POLYMER ADDITIVE FOR LUBRICATING OILS

A. M. Kuliev, A. M. Levshina, L. Ya. Vedeneeva, V. M. Farzaliev, F. G. Suleimanova, I. I. Namazov, and Sh. A. Mkhitaryan 15 Jan. 1971 8 p refs Transl. into ENGLISH from Prisadki K. Smaz. Maslam (USSR), no. 2, 1969 p 15-17
(AF Proj. 7343)
(AD-724983; FTD-HT-23-769-70; UR/0652-69-000-002) Avail: NTIS CSCL 11/8

A polyfunctional polymeric additive was prepared by neutralizing a mixture of an alkylphenol and the reaction product of an isobutylene-styrene copolymer and phosphorus pentasulfide with magnesium oxide in the presence of water and methyl alcohol with carbon dioxide. The additive was a light-brown viscous product, soluble in oils and exhibited good detergent, anticorrosive, and antioxidative properties. Author (GRA)

N72-10495# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYNTHESIS AND TESTING OF PHOSPHORIC ACID ESTERS OBTAINED ON A BASE OF CYCLOHEXANOL DERIVATIVES
I. M. Orudzheva and Sh. M. Novruzov 15 Jan. 1971 9 p ref Transl. into ENGLISH from Prisadki k Smaz. Maslam (USSR), no. 2, 1969 p 34-37
(AF Proj. 7343)
(AD-724984; FTD-HT-23-770-70; UR/0652-69-000-002) Avail: NTIS CSCL 11/8

Five phosphoric acid esters were synthesized on the basis of cyclohexanol derivatives; analysis results show that the elemental composition of these esters is close to the calculated theoretical level. Preliminary studies of the synthesized compounds showed that they are effective in improving the stability, thermal stability, and anticorrosion properties of oil D-11. Author (GRA)

N72-10496# Naval Air Development Center, Johnsville, Pa.
PIGMENTATION STUDY OF NARPOL PRIMER
A. Stander 30 Jun. 1971 20 p refs
(AD-725155; NADC-MA-7126) Avail: NTIS CSCL 11/3

The work was concerned with attempts to optimize the formulations of Narpol thermally stable aircraft coatings. Narpol is a partially fluorinated polyphenyl ester polymer. The Narpol coatings exhibit most of the requisite qualities of a high temperature (500F) resistant aircraft coating system except for sufficient adhesion to aircraft metals. The report covers the further evaluation of the most promising aluminum hydroxide pigmented primer along with other attempts to upgrade the adhesion of the Narpol coating system by changes in the pigmentation. Variations in pigmentation of the Narpol primer has not resulted in any improvement in the adhesion of the Narpol coating system. However, the use of camouflage topcoats instead of gloss, combined with a bake cycle improve the adhesion of the Narpol coating system. Author (GRA)

N72-10497# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
THE INFLUENCE OF STACKING SEQUENCE ON LAMINATE STRENGTH Technical Report, Sep. - Nov. 1970
N. J. Pagano and R. Byron Pipes (Gen. Dyn./Convair) Mar. 1971 22 p refs
(AF Proj. 7340)
(AD-725753; AFML-TR-71-8) Avail: NTIS CSCL 11/4

Based upon considerations relating to the nature of the interlaminar stresses in composite laminates, an approach is presented to predict the detailed stacking sequence of specific layer orientations which leads to optimum protection against delamination under uniaxial static and fatigue loadings. In particular, it is argued that the interlaminar normal stress, as well as the interlaminar shear stress, is instrumental in precipitating delamination and subsequent strength degradation. Correlation with existing experimental evidence of the stacking sequence phenomenon is presented. Author (GRA)

N72-10498 Temple Univ., Philadelphia, Pa.
EXPERIMENTAL INVESTIGATION OF NEGATIVE RESISTANCE IN CADMIUM SELENIDE POWERS Ph.D. Thesis
Lawrence J. Nicastro 1970 153 p
Avail: Univ. Microfilms Order No. 70-19761

The negative resistance in CdSe powders has two significant features: (1) the threshold voltage is reduced by incident light; and (2) light is emitted from the material when it is highly conducting. From a thorough examination of various theories of negative resistance in insulators, it was determined that only the theory due to Dumke, and extended by Weiser, provides an explanation for the sensitivity of the threshold voltage to light, and for the emission of light when the material is highly conducting. Therefore, the experimental investigation was carried out to interpret negative resistance in CdSe in terms of the Dumke-Weiser theory. The experimental observations and the results are described. Dissert. Abstr.

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N72-10499# University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.
THE RICCATI EQUATION AND ITS BOUNDS
Richard S. Bucy Jul. 1971 19 p refs
(Contract DA-ARO(D)-31-124-71-G37; Grant AF-AFOSR-1244-67; Project AF-9749)
(AD-727818; AFOSR-71-2067TR) Avail: NTIS CSCL 12/1

Improved a priori bounds are obtained for the Riccati equation. Further, the infinite lag error covariance for stationary problems is explicitly given in terms of the solutions of two Riccati equations. Author (GRA)

N72-10500# Rocketdyne, Canoga Park, Calif.
CONFIDENCE AND TOLERANCE BOUNDS AND A NEW GOODNESS OF FIT TEST FOR TWO PARAMETER WEIBULL OR EXTREME VALUE DISTRIBUTIONS (WITH TABLES FOR CENSORED SAMPLES OF SIZE 3(1)25) Final Report
Nancy R. Mann, Kenneth W. Fertig, and Ernest M. Scheuer Wright-Patterson AFB, Ohio ARL May 1971 101 p refs
(Contract F33615-70-C-1216; AF PROJ. 7071)
(AD-727797; ARL-71-0077) Avail: NTIS CSCL 12/1

The report consists of two papers, both of which apply to two-parameter Weibull and extreme-value distributions. In the first paper, a new goodness-of-fit test for the two-parameter Weibull or extreme-value distribution with unknown parameters is developed. Its power with respect to analogues of four classical tests is investigated and tables are given for using the test with samples of size n, n = 3(1)25, censored at the m-th smallest observation, m = 3(1)n. The second paper gives tables of values for obtaining confidence and tolerance bounds from best linear invariant estimates of parameters of extreme-value distributions. The tables apply to censored sample of size n, n = 3(1)25. Author (GRA)

N72-10501# Louisiana State Univ., Baton Rouge. Coll. of Engineering.
SPECTRAL ANALYSIS OF TRANSIENT DATA WITH APPLICATION TO AUTO-PILOT PARAMETER STUDIES
Raymond Speeg, G. D. Whitehouse, and A. J. McPhate May 1971 112 p refs
(Contract F44620-68-C-0021; AF Proj. 7921; Proj. Themis)
(AD-725068; THEMIS-LSU-T-TR-46; AFOSR-71-1797TR) Avail: NTIS CSCL 12/1

The objective of this work was to determine, through a frequency analysis approach, an appropriate range of values for the parameters which could be used to provide for an effective auto-pilot coupler transfer function. The power spectral density function for random data, describing the general frequency composition of the data in terms of the density of its mean square value was used in this analysis. Spectral plots of data generated by a digital simulation were compared to those of an actual flight test case used as a reference to determine when the appropriate range has been found. In the development a spectral analysis program was written that incorporates the Cookey-Tukey fast Fourier transfer, allowing the conversion of the data sets from the time domain to the frequency domain. This resulted in a range of values for the parameters of gain and lead in two channels of a model of the human pilot operator in an attacker-evader simulation. Author (GRA)

N72-10502# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE EFFECTS OF A FINITE TIME-BANDWIDTH PRODUCT ON THE COMPUTATION OF THE VARIANCE OF THE MEAN OF A LOW-PASS STATIONARY RANDOM PROCESS
Technical Report, Jan. - Jun. 1970
Walter A. Johnson 5 May 1971 34 p refs
(Contract F04701-70-C-0059)
(AD-725032; SAMSO-TR-71-101; TR-0059(6230-20)-1) Avail: NTIS CSCL 12/1

Expressions are derived for the variance of the mean and the variance of the difference of means for a low-pass stationary random process. The effects of a finite data time-bandwidth product are discussed. Author (GRA)

N72-10503# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
EQUIPARTITION OF ENERGY IN WAVE MOTION
R. J. Duffin Nov. 1970 9 p refs Repr. from J. Mathematical Analysis Appl., v. 32, no. 2, Nov. 1970 p 386-391
(Grants DA-ARO(D)-31-124-71-G17; DA-ARO(D)-31-124-G951; DA Proj. 20061102B14C)
(AD-725337; AROD-9300-4-M) Avail: NTIS CSCL 12/1

Of concern are solutions of the classical wave equation in three-dimensions. It is shown that if a solution has compact support then after a finite time the kinetic energy of the wave is constant and equals the potential energy. The proof employs the Paley-Wiener theorem of Fourier analysis. Author (GRA)

N72-10504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A CONTRACTING-INTERVAL PROGRAM FOR THE DANILEWSKI METHOD Ph.D. Thesis - Va. Univ.
James D. Harris Washington Nov. 1971 73 p refs
(NASA-TN-D-6429; L-7725) Avail: NTIS CSCL 12A

The concept of contracting-interval programs is applied to finding the eigenvalues of a matrix. The development is a three-step process in which (1) a program is developed for the reduction of a matrix to Hessenberg form, (2) a program is developed for the reduction of a Hessenberg matrix to colleague form, and (3) the characteristic polynomial with interval coefficients is readily obtained from the interval of colleague matrices. This interval polynomial is then factored into quadratic factors so that the eigenvalues may be obtained. To develop a contracting-interval program for factoring this polynomial with interval coefficients it is necessary to have an iteration method which converges even in the presence of controlled rounding errors. A theorem is stated giving sufficient conditions for the convergence of Newton's method when both the function and its Jacobian cannot be evaluated exactly but errors can be made proportional to the square of the norm of the difference between the previous two iterates. This theorem is applied to prove the convergence of the generalization of the Newton-Bairstow method that is used to obtain quadratic factors of the characteristic polynomial. Author

N72-10505 Stanford Univ., Calif.
REGRESSION WHEN BOTH VARIABLES ARE SUBJECT TO ERROR AND THE RANKS OF THEIR MEANS ARE KNOWN Ph.D. Thesis
James Hutchinson Ware 1970 91 p
Avail: Univ. Microfilms Order No. 70-18502

A particle moving in a two dimensional space along the path y = alpha + beta(x) according to some location function r(t) is considered. This is a regression problem with both variables subject to error. A class of estimators of the path is made available as grouped orthogonal least squares estimates. An asymptotic distribution theory for the various solutions, applications, and Monte Carlo results are discussed. The generalization of the tracking problem is also considered, using stochastic information. Dissert. Abstr.

N72-10506 Columbia Univ., New York.
RANDOM FRAGMENTATION OF A ROD Ph.D. Thesis
Stephen Joel Strauss 1970 65 p
Avail: Univ. Microfilms Order No. 70-18859

A point is chosen on a rod of uniform density in accordance with a given probability distribution. The rod is broken at the chosen point. One of the two resulting fragments is retained intact and the probability distribution is rescaled to fit the other fragment. In accordance with the rescaled probability distribution a point is then chosen on the latter fragment, which is broken there. Under the assumptions that the shorter of the two fragments is retained each time, that the breaking is performed each time independently, and that the probability distribution has a piecewise continuous density, a simple expression is found for the Mellin transform of the expected value of N(x) as well as asymptotic approximations for the expected value. Under the additional assumption that the probability distribution is uniform, an exact expression and better asymptotic expressions for the expected value are found. Dissert. Abstr.

N72-10507 Purdue Univ., Lafayette, Ind.
ON CERTAIN PRIORITY QUEUES Ph.D. Thesis
Sreekantan S. Nair 1970 184 p
Avail: Univ. Microfilms Order No. 70-18699

A queueing model is treated with two service units in tandem and a single server alternating between them. Two independent service units are also discussed with a single alternating between them. Two independent service units are also discussed with a single server serving alternatingly between them. The virtual waiting time process of an M/G/1 queue is examined with a priority rule based on the ranking of the service times. Applications of the different priority models are considered. Dissert. Abstr.

N72-10508 California Univ., Berkeley.
A STABILITY STUDY OF CONTINUOUS SYSTEMS UNDER PARAMETRIC EXCITATION Ph.D. Thesis
Teh Hwei Lee 1969 114 p
Avail: Univ. Microfilms Order No. 70-17600

A modified Liapunov's direct approach was used to derive the asymptotic stability criteria for some continuous systems under parametric excitation. The motion of these systems is governed by partial differential equations with time dependent coefficients. The stability of the trivial solutions of these equations was investigated. Analysis was made in the framework of metric spaces and the stability theorems were established by making use of the properties of Rayleigh's quotient and compact operators. The use of functionals with time dependent coefficients has resulted in considerable improvement over the earlier work in this area. Applications of the derived criteria to some physically interesting systems, elastic and aeroelastic, are presented. These include columns, plates and panels in airstream. Specific examples are given for the case of harmonic excitation. Numerical results are compared to previously published criteria. Dissert. Abstr.

N72-10509 Purdue Univ., Lafayette, Ind.
A NUMERICAL FORMULATION OF GALERKIN'S METHOD AND ITS APPLICATION TO NONLINEAR ENGINEERING PROBLEMS Ph.D. Thesis
Paul Robert Johansen 1970 131 p
Avail: Univ. Microfilms Order No. 70-18675

The application of Galerkin's method to nonlinear ordinary differential equations is reported. The differential equations considered arise either directly from mathematical models of real dynamic systems or from hypothetical models whose real analogies can be clearly seen. Developed is a numerical approach to finding approximate solutions by Galerkin's method for a nonlinear vehicle dynamics problem. In the process of solving the two-point problem, a numerical algorithm is obtained; the algorithm is applied to the Galerkin integral directly, and therefore analytical integration of the weighted equation residuals and solution of specific algebraic equations are not required. The numerical formulation renders Galerkin's method systematic, and it extends the utility of the method. Dissert. Abstr.

N72-10510 Purdue Univ., Lafayette, Ind.
CONTRIBUTIONS TO THE THEORY OF QUEUES WITH SEMI-MARKOVIAN FEATURES Ph.D. Thesis
Shun-Zer Chen 1970 112 p
Avail: Univ. Microfilms Order No. 70-18613

Semi-Markov arrivals and semi-Markov service times with single server, denoted by SM/SM/1, are considered under the queue discipline: first come, first served. The stability of the SM/SM/1 queue and a heavy traffic situation in a class of SM/SM/1 queues are discussed. The transient and asymptotic behavior of the waiting time process are treated using several techniques. Known results are extended to models with semi-Markovian structure. The SM/SM/infinity queue is studied. A storage model with semi-Markovian arrivals is presented. The content of the dam is analyzed. Dissert. Abstr.

N72-10511 Stanford Univ., Calif.
ON DISTRIBUTIONS AND MOMENTS OF SINGLE-EQUATION ESTIMATORS IN A SET OF SIMULTANEOUS LINEAR STOCHASTIC EQUATIONS Ph.D. Thesis
Roberto Sanchez Mariano 1970 90 p
Avail: Univ. Microfilms Order No. 70-18441

Two single equation estimators in a simultaneous system of linear stochastic equations - namely, limited information maximum likelihood (LIML) and two least squares (2SLS) are examined. Under the assumption that all predetermined variables are exogenous, three main results concerning the moments and distributions of the LIML and 2SLS estimators are given. For the general case of arbitrary number of endogenous variables included in the equation to be estimated, the two estimators are shown to be functions of non-central Wishart matrix. The LIML estimator is shown to be a right-hand characteristic vector corresponding to the smallest characteristics root. The 2SLS and LIML estimators are reduced to canonical form to set the stage for the derivation of the main results. As a byproduct of the reductions to canonical form, the exact functions of the original parameters of the model which affect the probability distributions of the OLS, 2SLS and LIML estimators are given. The exact probability distribution of the LIML estimator is deprived and the distribution function of the 2SLS estimator is approximated. Dissert. Abstr.

N72-10512 Rensselaer Polytechnic Inst., Troy, N.Y.
GENERAL MONTE CARLO METHODS FOR MULTIPLE SCATTERING PROBLEMS IN NEUTRON AND REACTOR PHYSICS Ph.D. Thesis
Frank George Bischoff 1970 353 p
Avail: Univ. Microfilms Order No. 70-19931

The Monte Carlo method of solution was successfully used to calculate multiple scattering and resolution effects in double-differential cross section experiments. Monte Carlo was shown to be superior to conventional transport techniques as regards both accuracy and computing time. A Monte Carlo computer code MSC was developed which is of general usefulness in analyzing double-differential scattering measurements. This code represents a three-dimensional solution of the transport equation. Resolution effects are calculated in detail by including fully time dependence in the calculation and considering individually the various factors which contribute to the experimental resolution. MSC uses statistical weights to improve the convergence of the Monte Carlo method by forcing scattering collisions. The statistical estimation technique used allows every collision to contribute to every energy and angular bin. Options were developed which treat elastic scattering from polycrystals (coherent and incoherent) in considerable detail. Dissert. Abstr.

N72-10513 California Univ., Los Angeles.
GEODESIC FLOW IN MANIFOLDS OF NEGATIVE CURVATURE Ph.D. Thesis
Patrick Barry Eberlein 1970 148 p
Avail: Univ. Microfilms Order No. 70-19844

Results are presented for the geodesic flow on a complete, n-dimensional manifold, M, not necessarily compact, of negative curvature which satisfies two axioms. Both axioms are satisfied if the curvature satisfies $K =$ or $< c < 0$. Dissert. Abstr.

N72-10306# Institute of Coastal Oceanography and Tides, Bidston (England).
AN ANALYTICAL TECHNIQUE TO MINIMIZE NOISE IN A SEARCH FOR LINES IN THE LOW FREQUENCY SPECTRUM
Petr Vanicek *In* Belgian Roy. Obs. Sixth Intern. Symp. on Earth Tides 1970 p 170-173 refs (See N72-10278 01-13)
Avail: NTIS

N72-10209# Joint Publications Research Service, Washington, D.C.
PROBLEMS OF LINEAR DYNAMIC PROGRAMING
Yu. P. Ivanilov and A. I. Propoy *In its* Cybernetics and Regulation Theory 3 Sep. 1971 p 13-18 (See N72-10206 01-10)
(UDC-517-949-21-519-35-62-50) Avail: NTIS

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N72-10514*# National Aeronautics and Space Administration, Washington, D.C.
FIVE HUNDRED BALLOONS FOR ONE SATELLITE [FIVE HUNDRED BALLOONS POUR UN SATELLITE]
H. de Saint-Blanquat Nov. 1971 13 p Transl. into ENGLISH from Sci. Avenir, France, no. 296, Oct. 1971 p 816-821, 867,870
(NASA-TT-F-14023) Avail: NTIS CSCL 04B

The launching of 500 balloons to work in conjunction with the Eole meteorological satellite gathering data on air currents, weather, and atmospheric conditions in Southern Hemisphere is discussed. The communication systems between the satellite and the balloons and between the satellite and ground control stations are described. Author

N72-10515*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Applied Science Div.
A STUDY OF THE EFFECTS OF RELATIVE HUMIDITY ON SMALL PARTICLE ADHESION TO SURFACES
W. J. Whitfield and Tom David Oct. 1971 32 p Sponsored in part by AEC
(NASA-Order W-12853)
(NASA-CR-122849; SC-RR-71-0721) Avail: NTIS CSCL 04B

Ambient dust ranging in size from less than one micron up to 140 microns was used as test particles. Relative humidities of 33% to 100% were used to condition test surfaces after loading with the test particles. A 20 psi nitrogen blowoff was used as the removal mechanism to test for particle adhesion. Particles were counted before and after blowoff to determine retention characteristics. Particle adhesion increased drastically as relative humidity increased above 50%. The greatest adhesion changes occurred within the first hour of conditioning time. Data are presented for total particle adhesion, for particles 10 microns and larger, and 50 microns and larger. Author

N72-10516# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jul. 1971 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JUILLET 1971]
Jul. 1971 15 p In FRENCH and DUTCH
Avail: NTIS

Meteorological parameters observed at different Belgian weather stations during July, 1971 are given. ESRO

N72-10517# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
YUMA PROVING GROUND, ARIZONA. CENTRAL METEOROLOGICAL OBSERVATORY Meteorological Data Report
Nov. 1970 73 p
(AD-727646) Avail: NTIS CSCL 04/2

The report contains the following meteorological data collected at Yuma Proving Ground, Arizona, during November 1970: Atmospheric precipitation, Atmospheric temperature; Atmospheric pressure; Humidity; Wind. GRA

N72-10518# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
FORT GREELY, ALASKA. CENTRAL METEOROLOGICAL OBSERVATORY Meteorological Data Report.
Dec. 1970 77 p
(AD-727643) Avail: NTIS CSCL 04/2

The report contains the following meteorological data collected at sites within Fort Greeley, Alaska during December 1970: Atmospheric precipitation; Atmsopheric temperature; Atmospheric pressure; Humidity; Wind. GRA

N72-10519# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
PANAMA CANAL ZONE. GUN HILL Meteorological Data Report
Nov. 1970 72 p
(AD-727645) Avail: NTIS CSCL 04/2

The report contains the following meteorological data collected at sites within Gun Hill Military reservation, Panama, during November 1970: Atmospheric precipitation; Atmospheric temperature; Atmospheric pressure; Humidity; Wind. GRA

N72-10520# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
PANAMA CANAL ZONE. FORT SHERMAN Meteorological Data Report
Nov. 1970 72 p
(AD-727644) Avail: NTIS CSCL 04/2

The report contains the following meteorological data collected at sites within Fort Sherman, Panama, during November 1970: Atmospheric precipitation; Atmospheric temperature; Atmospheric pressure; Humidity; Wind. GRA

N72-10521# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
TURBULENCE MEASUREMENTS FROM A T-ARRAY OF METEOROLOGICAL SENSORS
Manuel Armendariz, Laurence J. Rider, Gaylon S. Campbell, David Favier, and Juana Serna Fort Monmouth, N. J. ECOM Feb. 1971 387 p refs
(AD-727665; ECOM-5362; OSD-1366) Avail: NTIS HC $9.00/MF $0.95 CSCL 04/1

An array of meteorological instruments is described along with the fundamental characteristics of the instrumentation. Processing of data obtained with this array which forms a configuration of a T is discussed. Turbulence data computed from fast-response wind and temperature sensors placed at heights of 1.5, 4.0, and 16.0 meters above a heterogeneous semiarid terrain are presented. Data from the system were digitally recorded on magnetic tape compatible with digital computers at a rate of one scan per second even though the system is capable of scanning at one, two, or four scans per second. Data blocks of 15 minutes were utilized to obtain means and standard deviations of wind components and temperature, eddy correlations, vertical fluxes of heat and momentum and a stability index z/L. More than 150 hours of data collected during the months of January through April 1970 in blocks of data of time intervals of 2 to 7 hours are presented. Author (GRA)

N72-10522# National Oceanic and Atmospheric Administration, Rockville, Md. Weather Modification Div.
TROPICAL CUMULUS CLOUD MODIFICATION PROJECT Final Environmental Impact Statement
6 Apr. 1971 20 p
(PB-200694F) Avail: NTIS CSCL 13B

A series of cloud seeding experiments over southern Florida is reported. The project utilized a massive seeding technique involving the controlled release of the order of one kilogram of silver iodide in each treated cloud through dropping pyrotechnic flares from aircraft. Computerized models of the cloud-environment system were used to establish the seedability of the clouds. The report concerns plans to conduct a further series of cloud seeding experiments during the late spring or early summer of 1971 and succeeding years as required. Author (GRA)

N72-10523# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysik.
METEOROLOGICAL DATA. VOLUME 107, NO. 3: DAILY AND MONTHLY NORTHERN HEMISPHERE 30-MILLIBAR-SYNOPTIC WEATHER MAPS OF THE YEAR 1969. PART 3 Quarterly Status Report, Jul.-Sep. 1969
Dietrich Just, Barbara Kriester, Karin Labitzke, Renate Lenschow, Karin Petzoldt, Wolfgang Roeder, Richard Scherhag, and Karl Sieland 1970 116 p
(Contract DAJA37-70-C-2330)
(AD-727784; QTSR-3) Avail: NTIS CSCL 04/2

These tables contain daily height and temperature analysis of constant pressure levels for three months for the whole of the Northern Hemisphere, based on rawinsonde and in the upper stratosphere also on rocketsonde data and performed with the aid of a hydrostatic build-up method. The corresponding monthly mean maps, their variations and deviations are included as well as the mean grid point data, calculated from daily values. The stratospheric circulation of polar, middle, and tropical latitudes is described. Author (GRA)

N72-10524# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
DECISION AND INSTITUTIONAL ASPECTS OF WEATHER MODIFICATION Final Report, 1969 - 1971
Myron B. Fiering, Morton Horwitz, and Daniel F. Luecke Jun. 1971 146 p refs
(Contract DI-14-06-C-6850; Grant TI ES 20-06)
(PB-201101; Rept-44-723-7024; Rept-14-06-D-6850) Avail: NTIS CSCL 04B

By means of a mathematical model of the jury decision making process, it is shown that large instabilities are inherent in the existing legal system when applied to recovery of damages alleged to arise from attempts to modify the weather. The decision making process is generally biased in favor of the defendant. If the model is applied to decisions made by a panel of experts, it shows improved stability. Another model develops decision rules for precipitation augmentation. It includes explicitly economic measures of risk. These affect precipitation augmentation by promoting changes in systems operation, coupled with small increments in precipitation (with small risk), in contrast to large increments with correspondingly large risk. A

model of an insurance fund for damage claims is presented. A model statute is offered for establishing institutions to deal with regulation and monitoring effects in weather modification.
Author (GRA)

N72-10525# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
COLORADO RIVER BASIN PROJECT IN CLOUD SEEDING: 4 YEAR WEATHER MODIFICATION EXPERIMENT IN SW COLORADO FOR AUGMENTING WATER SUPPLIES Final Environmental Impact Statement
16 Jul. 1971 33 p
(PB-201086F) Avail: NTIS CSCL 04B

The project is a large scale application of cloud seeding techniques for increasing snowfall in mountainous areas, using the San Juan Mountain area in southwestern Colorado for the test. There will be four winter seasons of seeding, beginning with 1970-71. The experiments conducted at Climax and at the Wolf Creek Pass area of Colorado produced solid evidence that winter cloud seeding with ground-based silver iodide generators can produce an average snowfall increase of 10 to 30 percent. There is concern regarding the hazards posed by weather to residents and visitors in this mountainous area. In recognition of the social response to the danger of avalanches, especially in the Ouray-Silverton-Telluride area, there will be no seeding initially in subareas 3 and 4. Additional snow should not significantly increase snow removal costs. There may be some concern over the potential contamination of the environment by the silver iodide used as the seeding material. The ecological monitoring program includes an investigation of residual and long range accumulation effects of the silver iodide used in the experiment.
Author (GRA)

N72-10526# National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
WEATHER PREDICTIONS AND SURFACE RADIATION ESTIMATES FOR THE GASBUGGY EVENT Final Report
Robert H. Armstrong and Joseph R. Morrell 21 May 1971 56 p refs Sponsored in Part by El Paso Natural Gas Co. and Dept. of the Interior
(AEC Order SF-54-351)
(PNE-1008; PNE-g-75; TID-4500) Avail: NTIS

Three surface wind towers, located near gasbuggy surface ground zero, provided automatic measurements of surface wind speed and direction. These measurements were radio-telemetered to a master station in the weather trailer at the control point (CP). A 24-hour weather observing station, equipped to take upper-air soundings of wind, temperature, humidity, and pressure along with surface observations, became operational in the CP area two weeks prior to the event. Upper-wind observations were taken at three locations peripheral to the site. Event-oriented forecasts of winds, weather, vertical atmospheric stability, and air trajectories as well as estimates of potential radiation effects were presented. Intensive surveillance of meteorological conditions at the surface and aloft throughout the entire area of concern was maintained on D-Day.
Author (NSA)

N72-10527# National Oceanic and Atmospheric Administration, Washington, D.C.
LIGHTNING
1970 6 p ref
(NOAA/PI-70005; GPO:1971-0-413-234) Avail: SOD $0.15

Lightning is described as the secondary effect of electrification within a thunderstorm cloud system. The distribution of electricity in a cumulonimbus cloud is shown as a concentration of positive charge in the frozen upper layers, and a large negative charge around a positive area in the lower levels. The life cycle of a lightning stroke is pictorially described, and a list of safety precautions to be observed during thunderstorms is included.
F.O.S.

N72-10528# Chicago Univ., Ill. Dept. of Geophysical Sciences.
THE FILLING OVER LAND OF HURRICANE CAMILLE, 17-18 AUGUST 1969
Dorothy L. Bradbury Aug. 1971 28 p refs
(Grant NOAA-E-198-68(G))
(SMRP-RP-96) Avail: NTIS

A precise path of the center of hurricane Camille was determined by using radar, satellite, and other data reported over a 36-hour period. From this track, pressure profiles were constructed to represent the mean pressure distribution before landfall and after passing inland and filling. The rate of net mass flux was determined from the difference in the pressure profiles. An effort was made to compare the computed radar echo motions around the eye of the hurricane with observed wind speeds and with mean gradient winds derived from pressure profiles. The change in the wind speed pattern resulting from the filling process is shown.
Author

N72-10529# Chicago Univ., Ill. Dept. of Geophysical Sciences.
APPLICATION OF ATS 3 PHOTOGRAPHS FOR DETERMINATION OF DUST AND CLOUD VELOCITIES OVER THE NORTHERN TROPICAL ATLANTIC
T. Theodore Fujita Dec. 1970 20 p refs
(Grants ESSA-E-198-68(G); NSF GA-4203)
(SMRP-RP-90) Avail: NTIS

Data obtained on July 14, 1969 was selected from BOMEX Period 4 as the day for a detailed analysis of cloud velocity fields over the northern tropical Atlantic Ocean. A total of 375 low-cloud velocities were obtained between the ITCZ and 34N and 70 velocities between the ITCZ and the equator. These velocities were found to be very useful in understanding the circulation patterns over a vast region of water where little synoptic data is available. Over 170 high-cloud velocities were computed, mostly in areas of cloud clusters. It was found that a field of high-cloud divergence existed over most of the large cloud clusters in the ITCZ as well as over an easterly wave that appeared on this day. Motion of dust clouds from the Sahara was also computed by using an accelerated movie technique. It is concluded that ATS 3 picture sequences can be analyzed independently from conventional synoptic and/or network data so that the computed velocities of clouds, dust, and propagating waves can be used as supplementary data for past and future tropical experiments.
Author

N72-10530# Chicago Univ., Ill. Dept. of Geophysical Sciences.
COMPUTATION OF HEIGHT AND VELOCITY OF CLOUDS OVER BARBADOS FROM A WHOLE-SKY CAMERA NETWORK
Richard D. Lyons Aug. 1971 21 p refs
(Grant NSF GA-4203)
(SMRP-RP-95) Avail: NTIS

Cirrus clouds are often used as tracers for wind speed determination from satellite picture sequences, but additional cloud data is needed to correctly interpret the pictures. Methods were developed to compute the heights and velocities of clouds from a ground based whole-sky camera network. Preliminary results indicate close agreement between cloud data obtained from the camera network on 26 July 1969 in Barbados, W.I. and wind velocities at cloud levels.
Author

N72-10531# Dayton Univ. Research Inst., Ohio.
AN OPTIMUM METHOD FOR COMPUTING WINDS FROM A STARUTE TRAJECTORY
James K. Luers Mar. 1971 51 p refs
(Contract F19628-70-C-0166; AF PROJ. 6682)
(AD-724702; AFCRL-71-0150; SR-1) Avail: NTIS CSCL 04/2

The Starute System offers the capability of obtaining a highly accurate and detailed wind profile when tracked by an FPS-16 radar. A computer program has been written to utilize this potential in obtaining a wind profile. The wind accuracy achieved with the 'Starute Wind Program' between 30 and 60 km is an RMS wind error of 1 meter/second or less. Wave structure on the order of .5 kilometer is observable below 45 km and one kilometer structure to 60 kilometers. A discussion of the effect of vertical winds, apparent mass, and wind acceleration on a wind measurement is also included. The 'Starute Wind Program' is compared to the program in use at the Eastern Test Range from the standpoint of accuracy and frequency response. Author (GRA)

N72-10532# Hamburg Univ. (West Germany).
DYNAMICS OF ATMOSPHERIC MODELS [DYNAMISCHE MODELL-METEOROLOGIE]
Paul Raethjen 1971 193 p refs In GERMAN *Its* Hamburger Geophys. Einzelschriften, Heft 13
Avail: NTIS; Walter de Gruyter, Berlin: 18 DM

The hydrodynamic and thermodynamic principles of meteorological atmospheric models are summarized. Treating the earth as a planetary model, the heat and energy budget, circulation, and disturbances are discussed. The influence of the atmospheric boundary layers on meteorology is shown. Finally a correction of the planetary model is given by adding terrestrial effects. ESRO

N72-10533# Wyoming Univ., Laramie. Water Resources Research Inst.
WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA, WATER YEAR 1970
May 1971 283 p refs
(OWRR Proj. A-001-WYO(44))
(PB-201748; Rept-23) Avail: NTIS CSCL 04B

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and non-recording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800 and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. Author (GRA)

N72-10534# Wyoming Univ., Laramie. Water Resources Research Inst.
PRECIPITATION AND ITS MEASUREMENT: A STATE OF THE ART
Jun. 1971 79 p refs
(OWRR Proj. A-001-WYO(45))
(PB-201747; Rept-24) Avail: NTIS CSCL 04B

The report contains comprehensive review of the literature since 1966 for studies and articles dealing with precipitation and its measurement. Topics dissussed include gages, gage comparisons, gage shields, errors in measurements, precipitation data, data analysis, networks, and electronic measurements for rain and snow. A partially annotated bibliography of 350 references in included. Author (GRA)

N72-10535# National Weather Service, Silver Spring, Md. Data Acquisition Div.
WEATHER SERVICE OBSERVING HANDBOOK NO. 4: SAWRS SURFACE OBSERVATIONS
1971 88 p
(NOAA-WSOH-4-6-1-71) Avail: NTIS

Uniform instructions for weather observing and reporting techniques are presented to provide a system for standardized identification of meteorological phenomena. Areas of instructions include: surface weather observation, entries on Meteorological Form 1-10C, coding and dissemination, meteorological parameters, and operation of equipment. F.O.S.

N72-10536# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. HAWAIIAN AND SELECTED NORTH PACIFIC ISLAND COASTAL MARINE AREAS. VOLUME 3: AREA 8, MAJURO; AREA 9, KWAJALEIN; AREA 10, ENIWETOK
Jun. 1971 484 p
(AD-725138) Avail: NTIS HC $6.00/MF $0.95 CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed include the Majuro, Kwajalein and Eniwetok atolls. GRA

N72-10537# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. HAWAIIAN AND SELECTED NORTH PACIFIC ISLAND COASTAL MARINE AREAS. VOLUME 2: AREA 5; JOHNSTON ISLAND; AREA 6, MIDWAY ISLAND; AREA 7, WAKE ISLAND
Jun. 1971 483 p
(AD-725137) Avail: NTIS HC $6.00/MF $0.95 CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 TDF-11, Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Ashevelle as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed include Johnston Island, Midway Island, and Wake Island. GRA

N72-10538# Missouri Univ., Columbia. Dept. of Agricultural Engineering.
PHOTOGRAMMETRICALLY DETERMINED CLOUD-FREE LINES-OF-SIGHT AT COLUMBIA, MISSOURI Final Scientific Report, Dec. 1967 - Feb. 1971
Milton D. Shanklin and Joseph B. Landwehr Apr. 1971 194 p refs
(Contract F19628-68-C-0140; AF Proj. 8624)
(AD-725758; AFCRL-71-0273) Avail: NTIS CSCL 04/2

The probability of a cloud-free line-of-sight was determined at specified elevation angles and directions by using a camera with a 180 degree lens and infrared film to produce high-quality photograms of the sky. Three years of hourly data were used to analyze the probability with respect to the parameters of azimuth, elevation angle, season, time of day, sky cover, cloud type, and sunshine. A very unique probability surface as a function of sky cover and elevation angle of the line-of-sight, the two most important parameters, was constructed. The persistency of a cloud-free line-of-sight was determined by utilizing a summer season of photograms taken at five minute intervals. The persistency was analyzed for diurnal variations of up to six hours of consecutive observations. Author (GRA)

N72-10880*# Maryland Univ., College Park.
EXPERIMENT S007: CLOUD TOP SPECTROMETRY
F. Saiedy, D. Q. Wark (ESSA, Washington, D. C.), and W. A. Morgan (ESSA, Washington, D. C.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 415-426 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 04B

N72-10881*# Centre National de la Recherche Scientifique, Paris (France).
EXPERIMENT S051: DAYTIME SODIUM CLOUD
Jacques-Emile Blamont *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 427-430 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 04B

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N72-10539*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TARGET CONTRAST CONSIDERATIONS IN MILLIMETER WAVE RADIOMETRY FOR AIRBORNE NAVIGATION
A. Mayer Aug. 1971 73 p refs
(NASA-TM-X-62082) Avail: NTIS CSCL 17G

Target signal requirements for aircraft navigation systems that use radiometric receivers which map thermally emitted power radiated by terrain or power radiated by ground-based beacons are discussed. For selected millimeter wavelength bands, microwaves suffer relatively little degradation by absorption or scattering on passage through the atmosphere, despite extreme weather variations. Interest centers on 8-millimeter waves because of component availability, portability (small size), high image resolution, and all-weather capability at this wavelength. The idea of radiometric airborne navigation is introduced. Elements of radiometry, terrain radiation, and atmospheric transmission characteristics are reviewed. Data pertaining to these elements at 8 mm wavelength are collected. Calculation of radiometric contrasts is discussed for some simple models of terrain targets. Author

N72-10540*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ATTITUDE DETERMINATION OF A THREE AXES STABILIZED SPACECRAFT
Ai Chun Fang Sep. 1971 15 p refs
(NASA-TM-X-65744; X-565-71-430) Avail: NTIS CSCL 22B

An approach is presented for attitude determination of a three axis stabilized spacecraft. The employment of two independent vectors is described whose components with respect to two reference coordinate axes can be known. Such two coordinate axes are right-handed three mutually orthogonal axes systems of which one is fixed in the spacecraft and the other has known orientation in space. The relationship between the two systems are then expressed as mathematical equations with the use of the two reference vectors. By computing the derived equations, the attitude of the spacecraft can be obtained. Author

N72-10541# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBLE PRINCIPLES OF THE CONSTRUCTION OF INERTIAL NAVIGATION SYSTEMS
E. A. Devyanin 29 Jan. 1971 16 p refs Transl. into ENGLISH from Inzh. Zh., Mekh. Tuerd. Tela (Moscow), no. 6, 1969 p 10-14
(Project FTD-6050201)
(AD-727467; FTD-MT-24-302-70; DIA-T65-05-20A) Avail: NTIS CSCL 17/7

Certain possible layouts of inertial navigational systems with three newtonometers and a device to measure the distance to the surface of the earth are examined. Analysis is reduced to the following assumptions: the earth is held to be a sphere, its field of gravity is central; it is proposed that an object moves at a constant distance from its surface; instrument errors in the navigation system are not considered. In the following hypothesis equation of the ideal operation and equations of the errors of the navigational systems, differing from known errors, are obtained. The equations of errors are analyzed for very simple motions of the object. Author (GRA)

N72-10542# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
AIDS TO NAVIGATION RADAR REQUIREMENTS Interim Report
Wayne Rivers 18 May 1971 71 p refs
(Contract DOT-CG-10657-A; USCG-Proj. 792101/001)
(AD-725440; GIT-A-1277-1; TR-1) Avail: NTIS CSCL 17/7

The specifications of a stereotype maritime radar are assembled from a concensus of currently deployed radars for use with models of radar performance to define desired radar properties of a new series of navigation buoys. Model elements considered include detection thresholds in noise and clutter backgrounds, diffraction and duct propagation modes near the sea surface and shadowing by sea waves. Recommended buoy cross sections and estimates of detection ranges and probability of detection are given. Author (GRA)

N72-10543# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AIR TRAFFIC CONTROL Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1971
Herbert G. Weiss 15 May 1971 15 p refs
(Contract F19628-70-C-0230; AF Proj. 649L)
(AD-725743; ESD-TR-71-146) Avail: NTIS CSCL 17/7

The report discusses the activities under way in Division 4 that are funded mainly by the Air Force. The progress on two other ATC tasks, namely, the preparation of a Technical Development Plan for the Discrete Address Beacon System for the FAA OSEM and studies relating to Fourth Generation ATC System Concepts for the DOT transportation Systems Center, are reported separately. A highlight of this quarter was the successful conclusion of the testing phase of a laser warning system for Logan Airport. Author (GRA)

N72-10859*# Air Force Systems Command, Wright-Patterson AFB, Ohio. Air Force Avionics Lab.
EXPERIMENT D009: SIMPLE NAVIGATION
Robert M. Silva, Terry R. Jorris, and Eugene M. Vallerie, III (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 37-49 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

N72-10860*# Air Force Systems Command, Wright-Patterson AFB, Ohio.
EXPERIMENT D005: STAR OCCULTATION NAVIGATION
Robert M. Silva, Terry R. Jorris, and Eugene M. Vallerie, III (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 51-59 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

N72-10861*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENT T002: MANUAL NAVIGATION SIGHTINGS
Donald Smith *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 61-69 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

N72-10872*# Air Force Cambridge Research Labs., Bedford, Mass.
EXPERIMENT D010: ION SENSING ATTITUDE CONTROL
R. C Sagalyn and M. Smiddy *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 199-213 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N72-10544# Allmanna Svenska Elektriska A. B., Vasteras (Sweden).

COLIBRI: A COMPUTER CODE FOR SUBCHANNEL ANALYSIS

I. Devold and N.-O. Persson 1971 28 p refs Presented at 16th Nucl. Congr., Rome, 25-26 Mar. 1971
(Conf-710317-1) Avail: AEC Depository Libraries

A code, COLIBRI, was developed, which takes into account the different mechanisms in the axial and the radial directions of the rod bundles. Three mixing mechanisms for transport of energy between two channels are discussed. The experiments on two types of fuel assemblies, heavy-water and light-water, are described. Features of the COLIBRI code are given, and comparisons of the COLIBRI-program with experiments are made. NSA

N72-10545# Siemens-Schuckertwerke A. G., Erlangen (West Germany).

HIGH-PRESSURE CYCLE FOR CO2 WITH A SUPERCRITICAL BASE PRESSURE COMBINED WITH A SODIUM-COOLED FAST BREEDER (Na/CO2 PROJECT) [DER HD-PROZESS FUER CO2 MIT UEBERKRITISCHEM BASISDRUCK ZUSAMMEN MIT EINEM NATRIUMGEKUEHLTEN SCHNELLBRUETER (Na/CO2-PROJEKT)]

H. Pfost, K. Seitz, and M. Lauer (Intern. Atomreaktorbau Ges., Bensberg, W. Ger.) Oct. 1970 80 p refs In GERMAN; ENGLISH summary
(BMBW-FBK-70-18) Avail: AEC Depository Libraries

An investigation was made of whether a CO2 gas turbine cycle might be economically feasible for fast breeder power stations, as compared to a Na/Na/H2O plant. The following were described and determined: thermodynamic properties of the HP-CO2 process, at design parameters; variations of load and ambient temperature; cost differences with respect to SNR; and economy at 1000 MW(e). It was concluded that the Na/CO2 concept can be realized, but the lower efficiency cannot be compensated for by plant costs. At partial load the efficiency decreases quickly. Author (NSA)

N72-10546# Kernforschungsanlage, Juelich (West Germany).

BLANKET COOLING CONCEPTS AND HEAT CONVERSION CYCLES FOR CONTROLLED THERMONUCLEAR REACTORS

S. Foerster and Th. Bohn 17 Jun. 1971 17 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/K-13; Conf-710607-136) Avail: AEC Depository Libraries

The special features of different systems for blanket cooling and for heat conversion are described and discussed. The thermodynamic requirements for favorable operation of the different heat conversion cycles and those for the heat removal system from the CTR are pointed out. Also, the pumping power in magnetic or nonmagnetic coolant flows is considered. Selected solutions for combining the systems of blanket cooling and of heat conversion are compared with respect to plant efficiency, the lost volume fraction in the lithium blanket region, and the expected constructional and safety features. These comparisons are made for thermal powers of the reactor between 5,000 and 10,000 MW and toroidal configurations. Solutions to be preferred are pointed out. Author (NSA)

N72-10547# Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Neutronenphysik und Reaktortechnik.

NEUTRONIC AND THERMAL DESIGN ASPECTS OF THERMONUCLEAR FUSION REACTOR BLANKETS

H. Borgwaldt, W. H. Koehler, and K. E. Schroeter 17 Jun. 1971 20 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(CN-28/K-12; Conf-710607-135) Avail: AEC Depository Libraries

Discrete-ordinate transport theory calculations are presented for the tritium breeding ratio and power-density profiles from neutron and gamma heating in the first wall, the blanket, and the reflector of a cylindrical thermonuclear fusion reactor operating on the D-T cycle. Lithium isotopic composition and coolant (Li or flibe) are varied as parameters. Some of the breeding-ratio calculations are checked with Monte Carlo calculations. The results indicate that there should be no problem obtaining adequate tritium breeding, which is optimal at approximately the natural Li isotopic composition. Power densities in structural material are quite high and almost exclusively due to gamma heating. Switching from Li coolant to flibe increases the power produced in the blanket by about 15%, while it decreases the tritium breeding ratio between 10 and 20%. Author (NSA)

N72-10548# United Kingdom Atomic Energy Authority, Culham (England).

EFFICIENT RECIRCULATION OF POWER IN MIRROR REACTORS

J. G. Cordey, F. B. Marcus, D. R. Sweetman, and C. J. H. Watson 17 Jun. 1971 20 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion, Res. Madison, Wis., 17-23 Jun. 1971
(Conf-710607-128; CN-28/K-3) Avail: AEC Depository Library

A model of a mirror reactor system was developed that permits the overall cost of the system to be minimized with respect to the mirror ratio, mirror magnetic field, and injection energy. The model is based upon calculations of the maximum beta and the density distribution of the plasma and incorporates a number of assumptions about limiting technological parameters and costs. Both minimum-B and simple mirror systems and both D-T and D-He-3 fuel cycles were considered. Using the best present estimates of Q, the D-He-3 reactors are found to be considerably more expensive than the D-T systems. The use of a simple mirror system reduces the nuclear boiler component of the costs by a factor of about two. The minimum overall cost is found to occur when the mirror ratio is such that the maximum wall-loading criterion and maximum-beta criterion are simultaneously satisfied and the optimum mirror fields are comparatively modest. The optimum cost is found to be rather insensitive to the maximum permissible wall loading and to the mirror magnetic field. Author (NSA)

N72-10549# United Kingdom Atomic Energy Authority, Culham (England).

ON THE ECONOMIC FEASIBILITY OF STELLARATOR AND TOKAMAK FUSION REACTORS

A. Gibson, R. Hancox, and R. J. Bickerton 17 Jun. 1971 19 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-129; CN-28/K-4) Avail: AEC Depository Libraries

Studies were made of model designs for stellarator-type fusion reactors. These serve to highlight key technological and plasma physics problems that require solution. The basic conflict is between estimates of the critical beta for equilibrium and stability and the cost of high magnetic fields from superconducting multipolar coils. The effect of diffusion-driven currents on the critical beta and the effect of electric fields on estimates of the cross-field diffusion rate are considered. The inclusion of a 1.5 m blanket in a system with a short-range multipolar field makes it difficult to achieve economic operation in small sizes. However, the unit cost for this type of reactor falls rapidly with increasing size. Thus, if estimates for the critical beta can be realized and if low cost superconductors can be developed, a 10,000-MW(e) stellarator reactor is expected to meet target economic costs, which include a penalty for the large size. Author (NSA)

N72-10550# Kernforschungsanlage, Juelich (West Germany). Zentralabteilung Forschungsreaktoren.

BURNUP DETERMINATION THROUGH IRREVERSIBLE MIXING OF ACTIVATABLE ISOTOPES WITH FUEL [ABBRANDRESTIMMUNG DURCH IRREVERSIBLE BEIMISCHUNG AKTIVIERBARER ISOTOPE ZUM KERNBRENNSTOFF]

Erwin Muench 1970 101 p refs In GERMAN
(JUL-712-RE) Avail: AEC Depository Libraries

A nondestructive method for the determination of nuclear fuel burnup is described. The method consists of adding to the fuel an isotope which emits gamma radiation between 1 and 1.4 MeV after neutron activation. Isotopes suitable for this purpose are discussed with respect to cross section and half life. The method permits burnup determinations as early as four days following the end of irradiation and within ten seconds. Possibilities for application as well as proposals for technical arrangement of the method are described. NSA

N72-10551# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

AROMATIC HYDROCARBONS AS POTENTIAL SOURCE OF DILUENTS FOR NUCLEAR FUEL REPROCESSING TECHNOLOGY. RADIOLYTICAL AND CHEMICAL STABILITY

F. Baroncelli, A. Brignocchi, and G. M. Gasparini 12 Oct. 1970 24 p refs
(RT/CHI-(70)35) Avail: AEC Depository Libraries

The chemical and radiolytic stabiltiy of some pure and mixed aromatic hydrocarbons was examined to check their potential use as diluents in the nuclear fuel processing technology. Comparative tests in batches showed the pure compounds exhibit a better radiolitic and chemical stability than the mixtures. Mesitylene seems to behave better than the others as a potential alternative diluent for the liquid-liquid reprocessing of irradiated fuels. Author (NSA)

N72-10552# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

TEMPERATURE STABILIZATION IN HEAT EXCHANGE TUBES UNDER ALTERNATING HEAT FLUXES [TEMPERATURSTABILISIERUNG MIT WAERMEROHREN BEI WECHSELNDEN WAERMESTROEMEN]

K. R. Schlitt Mar. 1971 78 p refs In GERMAN
(EUR-4634-d) Avail: AEC Depository Libraries

The use of heat pipes for stabilizing or controlling the temperature in heat exchanger tubes under conditions of variable heat flux was investigated. It was concluded that, if the heat pipes are partially filled with a rare gas, they can be used for controlling the heat flux. The experimental results of the change of temperature between heat fluxes of 0.5 and 1.0 kW are 0.5% for a self-controlled water-cooled heat pipe and 2.2% for a corresponding radiation-cooled heat pipe. The results also show that temperature stabilization is strongly influenced by the change of the rare gas temperature during operation, expecially when the partial vapor pressure of the working fluid in this zone takes on a non-negligible value. Author (NSA)

N72-10553# Electricite de France, Paris.

CALCULATION METHODS FOR HETEROGENEITIES IN REACTORS OF THE NATURAL URANIUM GRAPHITE GAS TYPE [METHODES DE CALCUL DES HETEROGENEITIES DANS LES REACTEURS DE LA FILIERE URANIUM NATUREL GRAPHITE GAZ]

Serge Charbonneau and Jean-Claude Lefebvre Jan. 1971 98 p refs In FRENCH
(CEA-N-1398) Avail: AEC Depository Libraries

The principal methods used for neutron flux and reactivity calculations concerning natural uranium graphite moderated reactors are described. The problem of the typical heterogeneities encountered in this type of reactor such as control rods, empty channels, and burnup variations in fuel elements, is considered. The principal theoretical aspects of the methods are presented. Practical applications and accuracy are discussed. Author (NSA)

N72-10554# United Kingdom Atomic Energy Authority, Harwell (England).

DETERMINATION OF NEUTRON FLUXES IN THE MR REACTOR LOOPS AND MATERIALS-TESTING CHANNELS

V. I. Vikhrov, A. V. Borodin, and V. N. Perevezentsev Apr. 1970 21 p Transl. into ENGLISH from Russian rept. IAE-1912 Presented at Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct.-Nov. 1969
(LB/G-3007; Conf-691060-23; IAE-1912) Avail: AEC Depository Libraries

Using threshold detectors, energy spectra were studied, and fast neutron fluxes were measured in three typical MR-reactor positions: in the fuel-element holes, in the Be block, and in the side-reflector holes. To determine fast-neutron fluxes acting on the irradiated steel structures taken from the reactor, experimental methods were developed using the structural materials. Neutron fluxes were determined from the amount of MN-54 accumulated in the structural materials as a result of the (Fe-54)(n,p)Mn-54 threshold reaction. The Mn-54 activity was measured by an absolute method using gamma spectrometers with NaI(T1) and Ge(Li) detectors. Some results of fast-neutron flux measurements are presented for the reactor loop channels. The neutron fluxes were determined from the MN-54 accumulation in the fuel-element claddings. Author (NSA)

N72-10555# United Kingdom Atomic Energy Authority, Harwell (England).

EXTENDING THE EXPERIMENTAL CAPABILITIES IN REACTORS OF THE IRT TYPE

V. V. Goncharova, A. M. Glukhov, P. M. Egorenkov, V. N. Chernyshevich, P. I. Shavrov, and A. F. Yashin Apr. 1970 46 p Transl. into ENGLISH from Russian Rept. IAE-1920 Presented at Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct.-Nov. 1969
(LB/G-3008; Conf-691060-7; IAE-1920) Avail: AEC Depository Libraries

The project for redesign of the IRT reactors is described. The basis of the IRT-M project is the use of new fuel elements and a new cooling system. The principal thermal and physical parameters of the IRT-M reactor are given. Experience of dismantling and assembly work in the reactor pool is described, together with the radiation conditions met in the course of reconstruction of the IRT reactor which had operated for more than seven years. Possibilities of raising the power of the IRT-type reactors to 8 MW are discussed. Author (NSA)

N72-10556# United Kingdom Atomic Energy Authority, Harwell (England).

METHODS OF TESTING STRUCTURAL MATERIALS IN THE MR REACTOR

A. D. Amaev, A. N. Ivanov, V. N. Kuznetsov et al May 1970 29 p refs Transl. into ENGLISH from Russian rept. IAE-1917 Presented at Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct. - Nov. 1969
(LB/G-3004; Conf-691060-1; IAE-1917) Avail: AEC Depository Libraries

A description is given of the design of the containment devices used in irradiating and testing materials in the MR reactor at different neutron fluxes and temperatures. Some experimental procedures that are used for in-pile investigations are discussed, notably procedures for creep testing, temperature control, and corrosion tests. Author (NSA)

N72-10557# Danish Atomic Energy Commission, Risoe. Electronics Dept.

THE CAUSE/CONSEQUENCE DIAGRAM METHOD AS A

BASIS FOR QUANTITATIVE ACCIDENT ANALYSIS

Dan S. Nielsen May 1971 27 p refs
(RISO-M-1375; R-5-71) Avail: AEC Depository Libraries

A graphical method for analyzing relevant accidents in complex nuclear installations is presented. The method is a proposal for an expedient presentation of the logical connections between a spectrum of accident causes and a spectrum of relevant consequences, e.g. expressed in terms of fission products released to the population. Besides being a tool used in connection with the elimination of these consequences and their causes, the method serves as a basis from which the probability of occurrence of the individual consequences may be evaluated. The main principle of the method involves the concept of a critical event, which for example may often be described as a transgression of the safety limit of a vital reactor parameter, followed by two fault tree methods used in a combined way to determine the logical connections between the causes of the critical event and the possible consequences of it. Author (NSA)

N72-10558# Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.

FRANCO-BRITISH EXPERIMENTAL LOOP: TEMPERATURE EVOLUTION AFTER BLOWER STOP [BOUCLE D'ESSAI FRANCO-BRITANNIQUE EVOLUTION THERMIQUE APRES ARRET DES CIRCULATEURS]

Claude Trimouille Feb. 1971 70 p In FRENCH
(CEA-N-1415) Avail: AEC Depository Libraries

The resolution of a heat conduction problem within the flux area of an experimental loop without blower cooling is presented. The mathematikal model consists of a set of nonlinear ordinary differential equations with variable coefficients. The analog section of a hybrid computer simulates the process; the digital section verifies the simulation cabling, computes the potentiometer coefficients, and sets the initial conditions. Author (NSA)

N72-10559# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.

EFFECT OF HEAT SOURCE BOUNDARY CONDITIONS ON THE TEMPERATURE DISTRIBUTIONS IN TRANSVERSE AND HELICALLY RIBBED AGR FUEL PINS

J. Watts and P. L. Mantle Feb. 1971 23 p refs
(RD/B/N-1932) Avail: AEC Depository Libraries

Steady state temperature distributions in the ribbed can walls of advanced gas-cooled reactor fuel element pins are investigated analytically using the computer program ORSFT2. The reactor situation is examined where all the heat is generated in the fuel which fills the can. Temperature distributions thus obtained are compared with those that would arise in the laboratory, where the cans are often heated by passing an electric current axially through the can wall. Several examples are examined for different distributions of heat generation, corresponding to those expected in transverse and helically ribbed cans. It is concluded that in the interpretation of heat transfer tests, the correction required to allow for the heat generation in the ribs is small in the case of multistart cans, and negligible in the case of transverse ribbed cans. Data is also given for converting temperatures measured in the bore of test cans to maximum surface temperatures. Author (NSA)

N72-10560# United Kingdom Atomic Energy Authority, Harwell (England).

MONITORING OF INTEGRATED THERMAL AND FAST NEUTRON FLUXES IN EXPERIMENTAL CHANNELS OF THE VVR-M REACTOR AT THE USSR ACADEMY OF SCIENCES, A. F. IOFFEE INSTITUTE OF APPLIED PHYSICS

G. Ya. Vasilev and Yu. P. Semenov Nov. 1969 7 p refs Transl. into ENGLISH from Russian rept. FTI-234 Presented at Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct.-Nov. 1969
(LB/G-3023; Conf-691060-22; FTI-234) Avail: AEC Depository Libraries

Methods for measuring the integrated fast and thermal neutron fluxes in the vertical channels of the VVR-M reactor are described. NSA

N72-10561# United Kingdom Atomic Energy Authority, Harwell (England).

MINIMISATION OF THE REACTOR COMPONENT OF PHYSICS RESEARCH COSTS

Yu. V. Petrov Nov. 1969 19 p refs Transl. into ENGLISH from Russian report FTI-233 Presented at the Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct. - Nov. 1969
(LB/G-3022; Conf-691060-16; FTI-233) Avail: AEC Depository Libraries

Concepts are introduced of the cost of an individual event in a physics experiment and the productivity of a reactor for physical studies. The relation between these concepts and the neutron-physics parameters of the reactor, such as power, neutron fluxes, and fuel burnup is established. Examples are given of the application of these ideas to problems of choice of reflector, optimisation of neutron trap dimensions, and choice of optimum degree of fuel burnup. Author (NSA)

N72-10562# United Kingdom Atomic Energy Authority, Harwell (England).

TESTING EXPERIMENTAL FUEL ASSEMBLIES FOR POWER REACTORS IN THE MR REACTOR (EXPERIMENTAL PROCEDURES AND SOME RESULTS)

V. V. Goncharova, E. P. Ryazantsev, L. A. Goncharov, and A. B. Kruglov May 1970 20 p Transl. into ENGLISH from Russian report IAE-1918 Presented at the Joint UK/USSR Seminar on the Operation and Use of Res. and Testing Reactors, Harwell, Engl., Oct. - Nov. 1969
(LB/G-3005; Conf-691060-6; IAE-1918) Avail: AEC Depository Libraries

Experimental procedures for testing fuel elements and materials for power reactors in loop installations are discussed. Some specific examples of setting up and carrying out loop experiments are given. Brief results are presented from tests in the MR reactor on fuel elements made of sintered UO2 in Zr alloy cans for water moderated water cooled, and boiling power reactors. Author (NSA)

N72-10563# Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).

[DEVELOPMENT OF FAST, THERMAL, AND MATERIALS TESTING REACTORS, AND BASIC RESEARCH PROGRAMS] Annual Scientific Report, 1969

R. Billiau, L. Buyse, M. DeCoster, and H. Fredrix, eds. 1969 222 p refs
(NP-18809; D69/70) Avail: AEC Depository Libraries

The research and development activities of 1969 on nuclear reactor design and other related basic research are presented. Data include reactor safety, production and application of radioisotopes, construction of thermionic generators, and production efficiency of the reactors. E.H.W.

N72-10564# Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Material und Festkoerperfors-chung.

EXPERIMENTAL INVESTIGATION OF CREEP BUCKLING BEHAVIOR OF THIN-WALLED TUBES OF VERY-HIGH-TEMPERATURE MATERIAL [EXPERIMENTELLE UNTERSUCHUNG DES KRIECHBEULVERHALTENS DUENNWANDIGER ROHRE AUS HOCHWARMFESTEN WERKSTOFFEN]

H. Kaupa 29 Oct. 1971 70 p refs In GERMAN; ENGLISH summary
(KFK-1363) Avail: AEC Depository Libraries

The danger of creep buckling is inherent in thin walled tubes subjected to high external pressures at elevated temperatures, especially the fuel element cladding tubes of steam- or gas-cooled fast breeder reactors. The possibilities of such damage resulting in reactor operation are explained and the theories of creep buckling in the literature are reviewed. Results of a survey are presented on experiments concerned with studies of creep buckling. Results of creep buckling experiments are reported on thin-walled tubes of reactor cladding material. Accounts of the material used, the experimental setup, and the performance of the experiments are given. The results are represented in buckling time diagrams. Author (NSA)

N72-10565*# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Kernphysik.

PROPOSAL FOR INSTALLATION OF AN ANTI-COMPTON SPECTROMETER FOR NEUTRON CAPTURE GAMMA RAY SPECTROSCOPY

W. Michaelis, U. Fanger, and D. Heck May 1970 11 p refs
(NP-18923) Avail: AEC Depository Libraries

In the upper part of the applicable energy range from 100 keV to Mev a Ge(Li) anti-Compton spectrometer is superior to all other sophisticated instruments for resolution, precision, and sensitivity. In addition to three bent-crystal spectrometers being installed at the HFR, a powerful tool is suggested for the study of the neutron capture gamma-ray spectrum of practically all nuclei from a few keV up to 3 MeV. In the appendix the special requirements for the data processing are displayed. Author (NSA)

N72-10566# Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).

SOME BR2 IRRADIATION DEVICES FOR FAST REACTOR FUEL AND FUEL ELEMENTS

P. vonderHart Mar. 1971 46 p refs
(EUR-4632-E) Avail: AEC Depository Libraries

Three types of irradiation devices for fast reactor components which have been developed in the scope of the Fast Breeder Reactor program are examined. The FAFNIR features the irradiation of 6 mm oxide fuel pins, 500 to 1000 mm long, inside a cadmium-containing thimble. Recent work included fabrication and operation of fission gas pressure measurement rigs, and investigations to overcome the problem of thermocouple failure. The FASOLD concept covers a new type of BR2 irradiation device for high power, long term testing of carbide (nitride) fuel elements in an epicadmium neutron flux. The rig consists of a single-walled niobium carrier with NaK filling, containing fuel pin and thermocouples, and of an external removable cadmium screen with stainless steel cladding. The screen assembly can be removed from the rig and is replaced regularly to compensate the cadmium burn-up. Hence, no life-time limitation is caused by the screen. The 650 C sodium-filled nonfissile rig has been developed for the irradiation of flat and tubular specimens of candidate alloys for fast reactor fuel pin cladding. Author (NSA)

N72-10567# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorentwicklung.

THERMODYNAMIC FEASIBILITY OF HELIUM COOLING OF FUSION REACTORS

J. Darvas and G. Legewie Feb. 1971 25 p refs
(JUL-743-RG) Avail: AEC Depository Libraries

The possibilities of cooling the fusion reactor blanket by helium are discussed. Starting from blanket design according to present knowledge and from the much-better-known features of present-day helium technology, it is concluded from the calculations that the helium-cooling system is thermodynamically feasible and could be an attractive solution to the coolant problem. Author (NSA)

N72-10568# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Obninsk (USSR). Fiziko-Energeticheski Inst.

RESULTS OF THE CALCULATION FOR A STANDARD FAST REACTOR [REZULTATY RASCHETA STANDARTNOGO BYSTROGO REAKTORA]

L. P. Abagyan and L. V. Petrova 1970 14 p refs In RUSSIAN
(FEI-213) Avail: AEC Depository Libraries

A standard fast reactor is here understood to be a simple, spherical model of a fast reactor containing uranium oxide-plutonium fuel and a sodium coolant. Given a specified composition of the reactor (Pu-239, U-238, with Ni, Fe, Cr, Na, O also present), and given a particular set of dimensions, calculations were performed to obtain the critical mass, the neutron spectrum, the neutron balance, and the breeding of Pu. NSA

N72-10569# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

[SNAP-23A PROJECT, PHASE 1] Final Report, 1 Dec. 1969 - 28 Feb. 1970

Sep. 1970 101 p refs
(Contract AT(30-1)-3800; Project SNAP-23A)
(WANL-3800-46; WANL-TR-(SS)-6) Avail: NTIS

A summary is presented of the SNAP-23A Program from its inception to the conclusion of Phase 1. The reorientation of the program based on successful developments is indicated. Testing of the first mockup system, EMS, demonstrated that the SNAP-23A performance objectives had essentially been met. Therefore, the program proceeded directly to the design, fabrication, and testing of the fueled prototype mockup system, FPMS. Accomplishments include in excess of 12,500 hours total test time on the EMS with no change in system performance; an extensive materials test program was completed which confirms and supports materials chosen for the basic SNAP-23A design; an extensive component test program was completed. In particular this program qualified the converter, power conditioner, radiator, fuel capsule, and shield for their intended use; shock and vibration testing of the EMS system was successfully completed and demonstrated compliance with MILSTD-810A as required for this program; fueling of the FPMS system was completed and performance testing is underway. Author (NSA)

N72-10570# Trans-Tech Translations, Seattle, Wash.

CERTAIN PROPERTIES OF FUEL BEHAVIOR OF CAN AND STRUCTURAL MATERIALS IN FAST REACTOR CONDITIONS AND FUEL ELEMENT TESTING PROGRAM IN BOR-60 REACTOR

V. I. Prochorov, I. G. Lebedev, and N. V. Krasnoyarov 3 Nov. 1970 14 p refs Transl. into ENGLISH from RUSSIAN rept., 1969
(BNWL-TR-57) Avail: NTIS

Variations in fuel performance related to testing conditions are discussed emphasizing fast reactor fuels. In discussions of fuel testing, it is noted that fast reactor conditions can be realized in thermal reactors. Methods of testing fuel can materials are discussed, and plans for testing in the reactor are reviewed. Author (NSA)

N72-10571# Babcock and Wilcox Co., Lynchburg, Va. Research and Development Div.

GEL-ADDITION PROCESS CHEMICAL STUDIES Quarterly Progress Report, Nov. 1970 - Jan. 1971

R. V. Carlson, comp. Apr. 1971 25 p refs
(Contract AT(30-1)-3714)
(BAW-3714-20; UC-25; QPR-18) Avail: NTIS

The development of a sol-gel process and related processes for preparing (U,Pu)O2 fast reactor fuels is reported. Eighteen fuel pins containing U-235O2 to 20% PuO2 in the form of pellets, shards, and sol-gel microspheres were shipped to the EBR-2 for irradiation in an unencapsulated bundle. Fuel was fabricated and loaded in 16 additional pins. Most of these will replace pins in the EBR-2 bundle during scheduled outages. Gas analyses and detailed metallographic examinations of the 27 fuel pins contained in these capsules are in progress in hot cell facilities. Photomicrographs of as-ground cross sections of sphere-pac and pellet pins exposed at 6, 10, 15, and 20 kW/ft are shown. Author (NSA)

N72-10572# Oak Ridge National Lab., Tenn. Office of Language Services.

MECHANICAL PROPERTIES AT HIGH TEMPERATURE OF CERAMICS BASED ON PLUTONIUM. APPLICATION TO

FUEL ELEMENTS
Charles DeNovion and Robert Lallement May 1971 13 p refs Transl. into ENGLISH from French report CEA-Conf-1670 Sponsored by AEC
(ORNL-TR-2443; Conf-701028-1) Avail: NTIS

Results of creep rate measurements carried out under compression and at high temperature on mixed uranium and plutonium oxides and carbides are presented. The creep rate depends to a large extent on the composition and porosity of the compounds studied. It is shown how neutron irradiation modifies the results of experiments outside the pile. From these results, it should be possible to estimate the swelling caused by fission products and to foresee the deformation of fuel element cladding as a function of burnup. Author (NSA)

N72-10573# Westinghouse Electric Corp., Pittsburgh, Pa. Nuclear Fuel Div.
YANKEE CORE EVALUATION PROGRAM Final Report
J. B. Melehan Jan. 1971 148 p refs Sponsored by AEC
(WCAP-3017-5094) Avail: NTIS

Two advanced fuel assemblies were designed, fabricated, and irradiated. An irradiation and postirradiation examination program was designed to evaluate the assembly mechanical design and the performance of UO2 fuel rods clad with stainless steel and Zircaloy. Evaluation was made of removable Zircaloy-clad fuel rods which were removed from the assemblies prior to reprocessing. The assemblies were irradiated in the D7 and G4 core positions. Design and operating data for the assemblies are listed. Several months after Core 5 shutdown, the 28 removable fuel rods were given a limited nondestructive examination at the reactor site. The examination consisted of general visual inspection and gamma scan measurements to determine relative burnup and axial burnup profiles. Author (NSA)

N72-10574# Kernforschungszentrum, Karlsruhe (West Germany). Labor fuer Elektronik und Messtechnik.
THE HSD LOOP: A STEAM LOOP FOR CAN DAMAGE TESTS
S. Jacobi, I. Rautenberg, H. Beitner, W. Golly, U. Kujath, M. Link, D. Perinic, F. Remmel, T. Schmidt, G. Schmitz et al [1971] 79 p refs Transl. into ENGLISH from German report KFK-1255
(EURFNR-847; KFK-1255) Avail: NTIS

The release of fission products and fuel particles from a failed reactor fuel element, their transport and detection in steam, their deposition and decontamination of circuit components, the corrosion resistance of reactor materials, and the behavior of failed fuel elements are important design parameters of steam cooled reactors. For experiments of this kind a superheated steam test loop has been installed at the FR 2 reactor at Karlsruhe. This loop consists of a steam generator unit, an in-pile test bed for accommodation of the fuel pins, and an expansion unit, condenser, and low pressure section. The loop is controlled automatically and is run with indirect supervision. A two-out-of-three selection circuit actuates shutdown of the FR 2 reactor as soon as unsafe operating conditions are approached. Author (NSA)

N72-10575# Harvard Air Cleaning Lab., Cambridge, Mass. School of Public Health.
[RADIOACTIVE AEROSOL RESEARCH] Semiannual Progress Report, 8 Sep. 1970 - 28 Feb. 1971
M. W. First, D. W. Underhill, R. R. Hall, O. Grubner, P. C. Reist, T. W. Baldwin, and D. W. Moeller 28 Feb. 1971 52 p
(Contract AT(30-1)-841)
(NYO-841-24) Avail: NTIS

A radioactive noble gas adsorption system was designed for the FFTF which provided for adsorption on activated charcoal and adequate holdup time for decay of a substantial fraction of the short-lived activity. Design equations were developed which permit examination of bed performance over a wide range of temperatures, pressures, and bed configurations. Efficient removal of decay heat from the early adsorption stages is important for good charcoal performance. Experiments to measure the breakthrough curves for representative commerically-available gas adsorption charcoals at ambient temperature and at -78 C to determine adsorption coefficients of radiokrypton and xenon in an inert argon carrier gas are described. Equations are developed which make it possible to estimate the effect of a rupture in a pressurized fission gas holdup bed containing activated charcoal. Calculations of the amount of Na that will be lost from the surface of a hot molten pool by volatilization and the duration of a significant rate of Na evolution are re-examined and found to contain simplifying assumptions which seriously distort conclusions. Author (NSA)

N72-10576# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Engineering.
IN-SERVICE INSPECTION PROGRAM FOR NUCLEAR REACTOR VESSELS Semiannual Progress Report, 1 Sep. 1970 - 1 Mar. 1971
Robert D. Wylie 28 May 1971 156 p refs Prepared in cooperation with Edison Electron. Inst. and Tenn. Valley Authority, Knoxville
(SwRI Proj. 17-2440; EEI Proj. RP-79)
(PB-200518; SAPR-5; SAPR-5) Avail: NTIS CSCL 18I

Recent utility experience is reviewed with regard to coolant pressure boundary inspection for power reactors. A nondestructive test method evaluation facility was developed. Investigations of the acoustic spectrometer and acoustic emission techniques for continuous monitoring are discussed. Improvement in the reliability and reproducibility of conventional ultrasonic systems for reactor inspection is considered. Acoustic holography for visualization of flaws in thick-walled pressure vessels was studied. Author

N72-10577# Lockheed Missiles and Space Co., Palo Alto, Calif.
MEASUREMENTS OF THE RADIATION EFFECTS OF THE CHINESE THEROMONUCLEAR EXPLOSION ON 27 DECEMBER 1968 ON THE KOSMOS-259 AND KOSMOS-262
Iu. G. Shafer, V. I. Kozlov, I. S. Kirienko, A. D. Boliunova, R. B. Salimzibarov, and S. M. Oshchepkov [1971] 7 p refs Transl. into ENGLISH from Kosm. Issled. (Moscow), v. 9, no. 4, 1971 p 558-564
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Results are presented of measurements of the hard radiation associated with the nuclear explosion in the Chinese People's Republic. Two possible mechanisms of the effect of disturbances from the explosion on ERP particles are considered. One of them is the transport of trapped radiation under the effect of a single induced electromagnetic pulse originating as a result of the sudden expansion of the explosion plasma in the geomagnetic field. The scheme of the second mechanism is that natural oscillations of the magnetosphere are set off as a resonant cavity after the clicks by the explosion over the magnetosphere; the oscillations act on the same trapped radiation particles whose frequencies of oscillation are in resonance with them. As a result, transport with subsequent adiabatic acceleration of the high energy (about 100 MeV) protons from the shell is possible, which might indeed be due to recording protons with E > or = 190 MeV in the case of an explosion in China. Author

N72-10578# Los Alamos Scientific Lab., N.Mex.
KINETICS OF A FAST PULSED REACTOR IN A PERIODIC OR QUASI-PERIODIC STATE
T. Trombetti May 1971 23 p refs Transl. into ENGLISH from the Italian report RT/ING-(68)16
(LA-TR-71-44; RT/ING-(68)16) Avail: NTIS

A kinetic study of a fast pulsed reactor is performed in the case that the reactivity is a periodic function of time and the flux has reached an asymptotic quasi-periodic behavior. The study is carried out in both cases of constant and nonconstant delayed neutron source. An evaluation of the conditions for the operation of the code are also listed. Author (NSA)

N72-10579# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.

GUIDANCE IN NUCLEAR CRITICALITY SAFETY

J. T. Thomas 28 Apr. 1971 28 p refs Presented at the 17th Ann. Meeting of the Am. Nucl. Soc., Boston, 13-18 Jun. 1971

(Contract W-7405-eng-26)

(Y-DR-63; Conf-710606-4) Avail: NTIS

The introduction of a relation between unit mass and array reactivity in Monte Carlo calculations of the criticality of subcritical spherical components arranged in reflected cubic arrays is examined. Reference systems are used to investigate: the effect on array K sub eff of changes in unit, cell, and array shape; the substitution of concrete for water as a reflector; the degree of coupling between arrays separated and reflected by concrete of uniform thickness; and the degree of coupling between concrete-reflected arrays as a function of their separation. NSA

N72-10580 National Lending Library for Science and Technology, Boston Spa (England).

THE BEHAVIOUR OF THE FUEL/CAN GAP IN IRRADIATION EXPERIMENTS ON OXIDE-FUELLED PINS

Dietrich H. Geithoff (Kernforschungszentrum, Karlsruhe, West Germany) 28 Jul. 1971 15 p refs Transl. into ENGLISH from Proc. of Reactor Meeting, Deutsches Atomforum, Berlin, Apr. 1970 p 462-466 In ENGLISH and GERMAN

(NLL-Windscale-460-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

An investigation was undertaken to determine if fuel can gap, during irradiation experiments, is reduced by thermal expansion or structural changes at high burnup. Such a reduction was believed to cause the fuel to swell and allow fuel contact with the can. Results from experiments with UO2 and UO2/PuO2 pellet fuel show that the above statement is not entirely true. Post irradiation examinations of the specimens show that not all of the pellet circumference was in contact with the can. E.H.W.

N72-10581 North Carolina State Univ., Raleigh.

EFFECTS OF CONDENSATION ON THE TRANSPORT OF MATTER FROM VAPOR-NONCONDENSABLE GAS MIXTURES Ph.D. Thesis

Edward Daniel Hughes 1969 86 p

Avail: Univ. Microfilms Order No. 70-18959

A steady-state flux of matter of molecular size from a mixture of vapor and noncondensable gas to the walls of nuclear power reactor containment vessels during the condensation of the vapor can be predicted with this analysis. A boundary layer approach has been used in formulating the mass transfer problem and the resulting equations are solved numerically. Factors found to influence the matter flux include: the mass fraction of noncondensable gas in the bulk mixture, the temperature difference across the film of liquid condensate on the walls of the vessel, and the Schmidt number of the vapor-gas mixture and of the matter in the mixture. The influence of temperature differences across the vapor-gas-matter mixture boundary layer has been obtained by including the energy equation in the analysis. Dissert. Abstr.

N72-10582 California Univ., Los Angeles.

ANALYSIS OF NUCLEAR REACTOR EQUIPMENT RESPONSE TO EARTHQUAKE FORCES Ph.D. Thesis

George Shih-Chang Wang 1970 196 p

Avail: Univ. Microfilms Order No. 70-19912

The results of forced vibration experiments on a large central nuclear power station are presented, and a calculational procedure that reproduces the experimental results is described. Based upon the experimental data, a set of aseismic design criteria for the reactor components are also proposed and a comparison between the proposed criteria and a reference design is made. It is proposed that if the integrity of the reactor components can be guaranteed, the reactor containment structure could be considered unnecessary. The displacements of reactor components are nonlinear with respect to the applied force, even in low level force range used during the vibration tests. The proposed design criteria for the steam generator, the primary coolant pump, the pressurizer and the vital connecting piping take this nonlinear response into account. The peak displacements computed using the proposed design criteria are in close agreement with the existing design and the effects due to earthquake-like input of ground motion records from Taft 1952 and El Central 1940 earthquakes. Dissert. Abstr.

N72-10583 Purdue Univ., Lafayette, Ind.

AN INTEGRATED MODEL FOR TIME DEPENDENT AND EQUILIBIUM FUEL COMPOSITIONS IN FAST BREEDER REACTORS Ph.D. Thesis

Charles William Terrell 1970 135 p

Avail: Univ. Microfilms Order No. 70-18751

The model was used to investigate the effect of several parameters on the equilibrium plutonium composition, the time dependence of the core composition and the composition of discharge and feed as well as the surplus plutonium resulting from breeding. Closed recycle with joint reprocessing of core and blanket fuel was assumed for a 25-year reactor operating lifetime when the model was applied to a reference reactor. The model is intended to describe the changes in the fuel composition which occur over many fuel burnup cycles. Application of the model to the reference reactor indicates that for a closed fuel cycle, the time required to reach equilibrium in the fuel composition depends upon the start-up composition, residence time in the external fuel cycle, amount of burnup in core and blankets, and reactor design. In contrast, it was found that the equilibrium plutonium composition itself depends only on core and blanket burnup and reactor design characteristics.
Dissert. Abstr.

N72-10852*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.

MEASUREMENTS OF PLASMA PARAMETERS IN A SIMULATED THERMIONIC CONVERTER

K. Shimada *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 97-109 refs (See N72-10841 01-30)

Avail: NTIS CSCL 18K

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N72-10584# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.

DEVELOPMENT OF A CRYOGENIC SYNCHROTRON MAGNET WITH HIGH PURITY ALUMINUM COILS

W. Schauer, W. Specking, and P. Turowski May 1971 11 p refs Presented at 3d Intern. Conf. on Magnet Technol., Hamburg, 19-22 May 1970

(KFK-1219; Conf-700503-11) Avail: AEC Depository Libraries

Small iron magnets with aluminum exciting coils varying in purity have been tested at 4.2 K and 20.4 K in magnetic fields up to 30 KG. Resistivity ratio and magnetoresistance results are reported for pancakes wound from aluminium ribbon. At 4.2 K the relative resistivity increase due to the magnetoresistance tends to a saturation value of 1.5 at 30 KG, independent of the sample purity which is given by the pancake resistivity ratio in zero field and was measured to be 8000 for the best and 1500 for the worst material investigated. At 20.4 K, the relative resistivity increase becomes purity dependent in contradiction to Kohler's rule and was found to be 3.6 for the best and 1.5 for the worst material at 30 KG. Questions concerning the appropriate conductor material and configuration, temperature of operation and cooling performance are discussed. Author (NSA)

N72-10585*# Techtran Corp., Glen Burnie, Md.
A TWO-DIMENSIONAL PROBLEM IN THE ELECTRODYNAMICS OF STATIONARY (OR STEADY-FLOW) CURRENTS IN A NONLINEARLY CONDUCTIVE MEDIUM [OB ODNOY DVUMERNOY ZADACHE ELEKTRODINAMIKI STATISIONARNYKH TOKOV V NELINEYNO PROVODYASHCHEY SREDE]
I. M. Rutkyevich Washington NASA Jul. 1971 10 p refs
Transl. into ENGLISH from Zh. Prik. Mekhan. i Tech. Fiz. (Moscow), no. 6, 1970 p 49-53
(Contract NASw-2037)
(NASA-TT-F-13590) Avail: NTIS CSCL 20C

The simplest two-dimensional problem relating to the distribution of currents in a nonlinearly conductive medium above a flat wall made up of a semi-infinite electrode and insulator is examined. In computing steady state electric fields in certain media, the dependence of electroconductivity upon the magnitude of the current passage must be considered. A dual-temperature plasma of nonuniform ionization is discussed. In the case for which the conductivity law is close to linear (for example, when the density of the current is of sufficiently low magnitude), linearized equations can be used. The hodograph method was used to obtain an exact solution to any given law of variation in nonlinear conductivity. In formal respects, the problem set is analogous to the problem in gas dynamics regarding flow around a plate. Author

N72-10586*# Techtran Corp., Glen Burnie, Md.
COMPRESSION OF THE MAGNETIC FIELD IN A COLLAPSING SPHERICAL CAVITY [SZHATIYE MAGNITNOGO POLYA V SKHLOPYVAYUSHCHEYSYA SFERICHESKOY POLOSTI]
V. K. Bodulinskiy and Yu. A. Medvedyev Washington NASA Jul. 1971 6 p refs Transl. into ENGLISH from Zh. Prikl. Mekh. Tekh. Fiz. (Moscow), no. 6, 1970 p 114-115
(Contract NASw-2037)
(NASA-TT-F-13591) Avail: NTIS CSCL 20C

The characteristics method of analysis, employing integral transformations, was used. It describes a primary dimension physical phenomenon: magnetic field compression in a collapsing spherical cavity. Author

N72-10587*# Westinghouse Electric Corp., Baltimore, Md.
PHOTOTRANSISTOR IMAGING SYSTEM Patent Application
William F. List and David L. Farnsworth, inventers (to NASA) Filed 19 Aug. 1971 24 p Sponsored by NASA
(NASA-Case-MFS-20809; US-Patent-Appl-SN-173185) Avail: NTIS CSCL 20F

A televion-type phototransistor imaging system employing a mosaic of phototransistors formed on a semiconductor substrate and operated in a charge-storage mode is described. A charge-storage effect occurring between the substrate and an electrical conductor interconnecting emitters of the phototransistors is used to provide a system output across a load circuit connected between the substrate and a system ground. NASA

N72-10588# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris.
SPATIAL FREQUENCY FILTERING [FILTRAGE DES FREQUENCES SPATIALES]
Rembault 17 Dec. 1970 10 p In FRENCH
Avail: NTIS

Input of data in a correlator with the aim of developing a multichannel correlator with holographic lenses is discussed. Two types of devices were investigated: (1) when the input of data is provided for by reflection; this has proved feasible; and (2) when the input is performed by a matrix of liquid crystals; this development led to difficulties due to phase shift which are outlined. ESRO

N72-10589# National Physical Lab., Teddington (England). Acoustics Section.
INDEX OF NPL ACOUSTICS PUBLICATIONS, 1960 - 1970
D. W. Robinson, comp. Mar. 1971 39 p refs
(NPL-Aero-Ac-47) Avail: NTIS

This bibliography on acoustics comprises reports, separate publications, papers in scientific journals and contributions to published symposia. The works are listed in chronological order and are referred to in the subject index and author index by means of serial numbers. Author (ESRO)

N72-10590# National Physical Lab., Teddington (England). Environmental Unit.
INDEX OF CURRENT NOISE RESEARCH IN THE UNITED KINGDOM
M. E. Delany Dec. 1970 112 p refs
(NPL-Aero-Ac-46) Avail: NTIS

Over 300 projects from 100 different research establishments and university departments in Great Britain are briefly summarized and indexed by subject, researcher, and organization. ESRO

N72-10591# Ohio State Univ., Columbus. Electroscience Lab.
ANGLE OF ARRIVAL CALCULATIONS AT 10.6 MICRONS
Logan R. Zintsmaster and Stuart A. Collins, Jr. Griffiss AFB, N. Y. RADC Jun. 1971 128 p refs
(Contract F30602-71-C-0132; ARPA Order 1279)
(AD-727798; ESL-3163-1; RADC-TR-71-124) Avail: NTIS CSCL 20/6

The report deals with the specification of the angular position of objects, by measurement of the angles of arrival of light beams and with the measurement of uncertainties due to atmospheric turbulence. A survey of the literature is presented showing two approaches to angle of arrival, one for large aperture receivers and one for a single small aperture or a pair of a pinholes. Pertinent defining equations are presented for both cases and values are calculated for arrival angle mean square measured with a large aperture and correlation of arrival angles for small apertures. A synonymity between the small correlation function and large aperture mean square angle of arrival is presented and used to present further large aperture mean square values. This provides a significant simplification in calculation and measurement capabilities. Finally the regions of accuracy are presented for the Rytov approximation which forms the basis for the numeric calculations. Author (GRA)

N72-10592# National Physical Lab., Teddington (England). Environmental Unit.
PROPAGATION OF FINITE-AMPLITUDE NOISE IN TUBES
D. F. Pernet and R. C. Payne Mar. 1971 27 p refs
(NPL-AERO-Ac-48) Avail: NTIS

Pressure level spectrum is analyzed of the second harmonic component generated when a moderately intense noise signal propagates over a considerable distance in a tube, with an arbitrary relationship between attenuation and frequency. Experimental data are presented supporting the validity of the method, using bands of noise centered in the frequency range from 500 to 2000 Hz with bandwidths between one-third and two octaves. These noise signals were propagated over a distance of 60 m in a 4.92 cm diameter tube. ESRO

N72-10593# National Physical Lab., Teddington (England).
AN INVESTIGATION OF THE LOUDNESS OF NOISES WITH IMPULSIVE CHARACTERISTICS
M. S. Shipton, D. H. Evans, and D. W. Robinson Jul. 1971 38 p refs
(NPL-Ac-50) Avail: NTIS

A series of tests was carried out in 25 laboratories throughout the world in order to collect data, subjective and objective, on the loudness of a number of noises of an impulsive nature under the same acoustical conditions. Subjective results obtained using the method of adjustment with 21 subjects are given. A method of 1/3-octave band analysis for impulsive

sounds using a direct integration technique avoiding the use of direct reading instruments is described and it is shown that the loudness levels calculated from these analyses are in good agreement with the subjective results. For quasi-stable impulse sounds the impulse sound level meter appears to offer no advantage over conventional instruments for comparing loudness.
ESRO

N72-10594# National Physical Lab., Teddington (England). Aerodynamics Div.

VALUES OF AIR ATTENUATION FOR USE IN THE FREE-FIELD CALIBRATION OF MICROPHONES

M. E. Delany and E. N. Bazley Sep. 1970 25 p refs
(NPL-AERO-Ac-45) Avail: NTIS

When carrying out precise free-field calibrations of microphones by the reciprocity technique, it is necessary to allow for the effects of air attenuation. The computational procedures involved in predicting the attenuation are summarized and tabulated values based on two extensive experimental studies are presented. The ranges of frequency, temperature, and humidity commonly encountered in the laboratory are discussed.
Author (ESRO)

N72-10595*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VISIBLE AND NEAR-ULTRAVIOLET SPECTRA OF LOW-PRESSURE RARE-GAS MICROWAVE DISCHARGES

J. Perry Campbell, Ernie W. Spisz, and Robert L. Bowman Washington Nov. 1971 6 p refs
(NASA-TM-X-2421; E-6306) Avail: NTIS CSCL 20N

The spectral emission characteristics of three commercial low pressure rare gas discharge lamps wire obtained in the near ultraviolet and visible wavelength range. All three lamps show a difinite continuum over the entire wavelength range from 0.185 to 0.6 micrometers. Considerable line emission is superimposed on much of the continuum for wavelengths greater than 0.35 micrometers. These sources were used to make transmittance measurements on quartz samples in the near ultraviolet wavelength range.
Author

N72-10596# Brown Univ., Providence, R.I. Div. of Applied Mathematics.

A NONLINEAR ELECTROMAGNETIC THEORY, PART 1

Frederic Bisshopp Apr. 1971 58 p refs
(Contract N00014-67-A-0191-0017; NR Proj. 062-179/23)
(AD-724738; TR-16) Avail: NTIS CSCL 20/3

By adding one term to the Lagrangian density that governs classical electromagnetic theory via Maxwell's equations, a parameter-free nonlinear generalization can be formulated. Some properties of plane waves, wavepackets, and self-focussed beams in the resulting nonlinear vector field theory are discussed.
Author (GRA)

N72-10597# Wisconsin Univ., Madison. Mathematics Research Center.

AN ITERATIVE ALGORITHM FOR CALCULATING POTENTIALS NEAR SMALL GROUPS OF FINITE CHARGED PLATES Technical Summary Report

F. S. Acton (Princeton Univ.) and J. Barkley Rosser Dec. 1970 19 p refs
(Grant DA-31-124-ARO(D)-462)
(AD-725096; MRC-TSR-1120) Avail: NTIS CSCL 20/3

Good approximations for the potentials around condenser plate arrangements found in many pieces of equipment in electron optics can be had by passing a plane through the middle of the condenser and solving for a 2-dimensional potential in this plane. Except for the very simplest geometries, one cannot handle even this 2-dimensional problem very well. An iterative procedure is explained which can be used to get approximate 2-dimensional potentials in the neighborhood of a finite number of finite charged plates, whatever the geometry. For a simple geometry which occurs in the electrostatic lenses of cathode-ray tubes, convergence of the procedure was very fast.
Author (GRA)

N72-10598 Stanford Univ., Calif.

Nd(3 PLUS):YAG PUMP FOR NONLINEAR OPTICAL EXPERIMENTS Ph.D. Thesis

Richard William Wallace 1970 88 p
Avail: Univ. Microfilms Order No. 70-18498

A high-power Q switchable line in the blue region of the spectrum is studied for use in pumping tunable optical parametric oscillators. A calculation of the internal second harmonic conversion required to maximize the peak-generated second harmonic power is given, and the experimental results of inserting an additional Nd(3 plus):YAG rod into the laser cavity for use as a saturable absorber Q switch are presented. A technique for fast tuning of either an optical parametric oscillator or an optical filter is discussed. The tuning is achieved by using an acoustic wave of such frequency that its wave vector closes the dispersion gap. Results of a material study to develop a crystal for an infrared parametric oscillator are also presented. Accurate measurements of the refractive indices of CdS were obtained and are listed.
Dissert. Abstr.

N72-10599 National Lending Library for Science and Technology, Boston Spa (England).

RESONANCE EFFECTS IN MAGNETIC CONFIGURATIONS HAVING A HELICAL MAGNETIC AXIS, WITH ALLOWANCE FOR TOROIDALITY

V. F. Aleksin, V. V. Nemov, and A. A. Shishkin 28 Jul. 1971 20 p refs Transl. into ENGLISH from Russian report KhFTI-70-72
(NLL-CTO-764-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Conditions for splitting of the magnetic axis are considered, and the order of magnitude of the distance between the new axes and that of the original linear system is stated. The appendix deals, for specific cases, with the possible use of a uniform transverse external field to compensate the toroidal displacement of the magnetic axis in the nonresonance case.
Author

N72-10600 Stanford Univ., Calif.

SOUND WAVE INTERACTIONS IN InSb Ph.D. Thesis

Roger Kenneth Route 1970 75 p
Avail: Univ. Microfilms Order No. 70-18467

The interaction between microwave acoustic waves and drifting electrons in high mobility n-InSb at 77 K in a transverse magnetic field was investigated. Detailed measurements of acoustic amplification in the range 0.5-2.0 GHz for shear waves propagating in the 110 direction are presented. Using bulk LiNbO3 transducers, acoustic gain as a function of electron drift velocity was determined for the range of magnetic fields 0 to 9 KG. While the transverse magnetic field reduced the effective RF mobility, thus lowering the drift velocity for maximum acoustic gain, the dc mobility was unaffected due to the presence of the Hall field. Maximum acoustic gain occurred for drift fields of only a few volts/cm, and the dc power dissipation was sufficiently low to allow CW operation of the device. The experimental results agree with the macroscopic theory only for magnetic fields in excess of 3 KG because the carrier mean-free-path is larger than the acoustic wavelength at microwave frequencies.
Dissert Abstr.

N72-10601 California Inst. of Tech., Pasadena.

DILUTION REFRIGERATION AND A CALORIMETRIC MEASUREMENT OF THE QUADRUPOLE COUPLING CONSTANT IN RHENIUM METAL Ph.D. Thesis

Stephen Dell Rockwood 1970 169 p
Avail: Univ. Microfilms Order No. 70-18046

A dilution refrigerator capable of producing steady state temperatures less than .075 K was constructed. The refrigerator's performance is compared with the operating characteristics of three other dilution refrigerators previously developed. The refrigerator was used to measure the nuclear contribution to the low temperature specific heat of a pure, single crystal sample of rhenium metal. Measurements were made in magnetic fields from 0 to 12.5 kOe for the temperature range .13 to .52 K. The results of these experiments are discussed. Dissert. Abstr.

N72-10602 Stanford Univ., Calif.

SUPERCONDUCTIVITY IN NEARLY ONE-DIMENSIONAL WIRES Ph.D. Thesis

George Edward Possin 1970 85 p
Avail: Univ. Microfilms Order No. 70-18458

The effect of intrinsic fluctuations on the superconducting transition in tin wires with diameters between 450A and 1000A and lengths of the order of 14 microns was studied. The wires were prepared by electroplating from acid solution into small holes etched in mica. The holes were produced by etching out the damage tracks produced by high energy fission fragments. The effect of thermodynamic fluctuations on the superconducting transition is also included. Dissert. Abstr.

N72-10603 Louisiana State Univ., Baton Rouge.

THERMAL CONDUCTIVITY AND THERMAL EFFECTS IN SUPERCONDUCTING NIOBIUM Ph.D. Thesis

Syed Mohammad Wasim 1970 111 p
Avail: Univ. Microfilms Order No. 70-18570

The temperature dependence of the magnetocaloric effect, its distribution over the mixed state and the magnetization were measured in a niobium single crystal. From these results magnetocaloric cooling, enthalpy and free energy were calculated and discussed. The irreversible hysteretic heating in the mixed state and its field and temperature dependence were discussed in terms of the pinning forces in the light of Morton's theory. The reduced upper critical field and the reduced Ginsburg-Landau parameter as obtained from magnetocaloric measurements are found to increase faster with decreasing temperature than predicated by the theory. The flux flow resistivity and the corresponding heat dissipation in both parallel and perpendicular fields were measure. Dissert. Abstr.

N72-10604 North Carolina State Univ., Raleigh.

ONE DIMENSIONAL ELECTRICAL CONDUCTION UNDER THE INFLUENCE OF ACOUSTIC AND OPTICAL PHONON SCATTERING Ph.D. Thesis

Richard Planck Williams 1970 85 p
Avail: Univ. Microfilms Order No. 70-18987

Electrical conduction was investigated by formulating the Boltzmann transport equation with collision integrals. The problem was reduced to one dimension without altering the characteristic form and energy dependence of the collision terms. A parabolic energy band structure and a realistic phonon dispersion relation were incorporated in the model. The Boltzmann equation is treated in detail and restrictive approximations are avoided. The distribution function mobility, and average electron energy are calculated as functions of electric field for several combinations of material parameters. The Boltzmann equation was examined to determine how well it is satisfied, and the assumed form of the distribution function was found to be adequate at all but the highest electric fields. The accuracy at high fields was improved in circumstances where the distribution function is rather energetic and slowly varying. Dissert. Abstr.

N72-10605 Catholic Univ. of America, Washington, D.C.

THE TEMPERATURE DEPENDENCE OF THE MAGNETO-ACOUSTIC EFFECT IN POTASSIUM Ph.D. Thesis

Thomas J. Witt 1970 96 p
Avail: Univ. Microfilms Order No. 70-20048

Observations of magnetoacoustic geometric resonances were made on pure single crystals of potassium for temperatures ranging from 1.27 K to 8.5 K and above. The data consist of plots of the relative attenuation of longitudinal ultrasonic waves versus the strength of the transverse external magnetic field. A quantitative comparison of the data with the free electron theory is made by using three fitting parameters. Two of these are scaling factors for the ordinate and abscissa and are related to Fermi surface properties of the metal. Of particular interest is the third parameter, the mean free path of the electron. Agreement with the theoretical curves is obtained assuming that the mean free path at high magnetic fields is 1.1 to 1.25 times larger than the low field value. It is proposed that this behavior is due to the failure of the present free electron theory to properly describe small angle electron scattering which is proportionally more effective at low magnetic fields. Dissert. Abstr.

N72-10606 Purdue Univ., Lafayette, Ind.

THE OPTICAL STUDY OF THE HYPERFINE STRUCTURE OF THE RUBIDIUM RESONANCE LINES Ph.D. Thesis

James Russell Beacham 1970 74 p
Avail: Univ. Microfilms Order No. 70-18593

An atomic-beam light source has been developed for the optical study of alkali emission spectra. The source was used to study the hyperfine structure of the resonance lines of Rb isotopes 85 and 87. The small Doppler width of this source, 1.5 millicuries, permitted the first optical measurements on individual transitions that make up these two resonance lines, 7802 A and 7949 A. The experiment consisted of two parts. In the first, the relative intensities and separations of the individual components were measured by means of a pressure-scanned Fabry-Perot spectrometer with digitized output. From these measurements isotope shifts of 2.68 millicuries for 7802 A and 2.59 millicuries for 7949 A were obtained. In the second part of the experiment, the absolute wavelength (in vacuum) of one hfs component is each resonance line was measured interferometrically by comparison with the international standard of length, Kr 6056.802105 A. From these measurements the centers of gravity for the two lines are calculated. Dissert. Abstr.

N72-10607 Purdue Univ., Lafayette, Ind.

EXPERIMENTAL INVESTIGATION OF OSCILLATORY PHOTOCONDUCTIVITY IN InSb AND ZnTe Ph.D. Thesis

Vincent John Mazurczyk 1970 114 p
Avail: Univ. Microfilms Order No. 70-18693

Measurements of photoconductivity were made using n-type InSb, p-type ZnTe,and P-type InSb. All of the samples investigated exhibited oscillatory photoconductivity. In addition periodic structure was observed in the spectra of ZnTe which corresponded to strong peaks in the absorption. In n-type InSb the mechanism responsible for oscillation was firmly determined to be periodic variation of mobility with wavelength. Variation of photoconductivity with temperature revealed the presence of minority carrier trapping which reduced the magnitude of the oscillation. The magnitude of the intrinsic photoconductivity dropped off sharply for electric fields greater than 0.1V/an. The effect is the result of a dependence of surface recombination velocity on electric field. The oscillation in ZnTe revealed the presence of three impurities in one sample and two in another. The only mechanisms for oscallation which could be ruled out were preferential momentum loss mechanism and resonance recombination with the ground state of the impurity. Dissert. Abstr.

N72-10608 Rochester Univ., N.Y.

FLUCTUATION EFFECTS IN ONE- AND TWO-DIMENSIONAL SUPERCONDUCTORS Ph.D. Thesis

Warren E. Masker 1970 157 p
Avail: Univ. Microfilms Order No. 70-17897

The temperature region near the critical temperature of a superconductor was studied to investigate the breakdown of mean field theory due to thermodynamic fluctuations. The experiments were confined to one- and two-dimensional samples and included samples with very short mean free paths. In one segment attention was focused on the broadening of resistive transition of two-dimensional superconducting films caused by fluctuations. The samples used in these experiments were granular aluminum films prepared by evaporating aluminum in the presence of oxygen. The conductivity as a function of temperature was examined over five orders of magnitude and the results compared with existing theories. A study of precursive superconductance was also undertaken using aluminum films with a range of mean free paths spanning four orders of magnitude. It was found that in all cases the resistivity as a function of temperatuer of followed the Curie-Weiss law predicted by Aslamazov and Larkin. Dissert. Abstr.

N72-10609 Stanford Univ., Calif.
ACTIVATION MEASUREMENTS OF THE DOPPLER EFFECT IN URANIUM-238 AND THORIUM-232 AS A FUNCTION OF SURFACE AREA-TO-MASS RATIO Ph.D. Thesis
Robert Needy Whitesel 1970 225 p
Avail: Univ. Microfilms Order No. 70-18505

The Doppler effect in U-238 and Th-232 metal samples was measured by the activation technique in a 1-E spectrum. The samples consisted of foils (or packets of foils) irradiated under cadmium near the center of the Pool Reactor. All of the measuremetns were performed at a heated sample temperature of 500 K. The surface area-to-mass ratio (S/M) of the uranium samples ranged from 1 to 20 sq cm/gm; thorium samples and S/M's of 7 and 20 sq cm/gm. Experimental results were compared with predictions based on calculations using the GAROL, ZUT, and TUZ codes. The experimental Doppler ratio (R) is defined by: R = heated sample activity/unheated sample activity. A similar quantity is defined for the ratio of the calculated total capture integrals for the heated and unheated samples. The differences between experimental and theoretical values of R - 1 for U-238 ranged from 1 to 10%. In the case of thorium, the differences were less than 5%. Experimental uncertainties in R were 0.5% or less. Dissert. Abstr.

N72-10845*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
ONSET OF SUPERCONDUCTIVITY IN SODIUM AND POTASSIUM INTERCALATED MOLYBDENUM DISULPHIDE
R. B. Somoano and A. Rembaum *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 33-37 refs (See N72-10841 01-30)
Avail: NTIS CSCL 20L

N72-10252# Imperial Coll. of Science and Technology, London (England).
TRANSMISSION OF LOW FREQUENCY JET PIPE SOUND THROUGH A NOZZLE FLOW
J. E. FfowcsWilliams *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 8 p (See N72-10245 01-12) (jefw/69) Avail: NTIS HC $6.00/MF $0.95

N72-10253# Imperial Coll. of Science and Technology, London (England).
JET NOISE AT VERY LOW AND VERY HIGH SPEED
J. E. FfowcsWilliams *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 9 p refs (See N72-10245 01-12)
Avail: NTIS HC $6.00/MF $0.95

N72-10254# Rolls-Royce, Ltd., Bristol (England). Bristol Engine Div.
ON THE NOISE SOURCES OF THE UNSUPPRESSED HIGH SPEED JET
K. A. Bishop, J. E. FfowcsWilliams (Imperial Coll. of Sci. and Technol.), and W. Smith *In* von Karman Inst. for Fluid Dyn. Turbulent Jet Flows 1971 17 p refs (See N72-10245 01-12) (ARC-32723; F.M.4211; N.730) Avail: NTIS HC $6.00/MF $0.95

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N72-10610# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
NON-ROTATIONAL STATES OF ODD MASS NUCLEI IN THE ACTINIDE REGION
A. L. Komov, L. A. Malov, and V. G. Soloviev 1971 17 p refs In RUSSIAN
(JINR-P4-5693) Avail: AEC Depository Libraries

The energies and wave functions for nonrotational states of odd-mass nuclei in the actinide region are calculated in the superfluid nuclear model. A rather good agreement of the energies of the low-lying nonrotational states in Am-243, Bk-247, Cm-243, Np-235, Np-239, Pu-237, Pu-243, and U-239 was obtained. Author (NSA)

N72-10611# Akademiya Nauk SSSR, Novosibirsk. Institut Matematiki.
HIGH-ENERGY SCATTERING OF CHARGED PARTICLES AND BETHE FORMULA
Yu. N. Kaffiev 1970 16 p refs
(NP-18540) Avail: AEC Depository Libraries

Coulomb corrections to the nuclear amplitude are considered. It is shown that in general the Bethe formula doesn't hold, and its breaking is due to the presence in the amplitude potentials with different radio or rescatterings. Regge behavior of the amplitude at high energies is assumed, and the radiation phase shift and its asymptote are found. Author (NSA)

N72-10612# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
THE RHO MESON PRODUCTION IN HIGH ENERGY PION-COLLISIONS WITH NUCLEI
Z. R. Babaev, V. V. Balashov, G. Ya. Korenman, V. L. Korotkich, and B. Tecku 1969 11 p refs In RUSSIAN
(IFVE-STF-69-71) Avail: AEC Depository Libraries

On the basis of Glauber multiple scattering theory, theoretical calculations of coherent and incoherent processes such as pion(-) A yields rho meson(-) A(1) and pion(-) A yields rho meson(0) A(1) were carried out. The calculations were made at the energy of 30 GeV of incident pions on nuclei from A = 20 to A = 208. A comparison of analogous processes in selection rules for gamma A yields pion(0) A at different energies was made. Author (NSA)

N72-10613# Australian Inst. of Nuclear Science and Engineering, Lucas Heights.
[NUCLEAR SCIENCES RESEARCH] Annual Report, year ended 31 Dec. 1969
Dec. 1969 53 p refs
(NP-18803) Avail: AEC Depository Libraries

The Institute's activities during the 1969 calendar year are reviewed including the maintenance of the neutron diffraction research group at Lucas Heights and research support at Australian universities. Research and training grants, fellowships, studentships, and titles of papers presented at the Institute's plasma physics conference, heat transfer and fluid flow conference, and radiation biology conference are listed. Summaries of projects and publications arising from such projects are given. NSA

N72-10614# Technische Hogeschool, Delft (Netherlands).
ACTIVATION ANALYSIS OF OXYGEN WITH THE AID OF TRITIUM Ph.D. Thesis [ACTIVERINGSANALYSE VAN

ZUURSTOF MET BEHULP VAN TRITONEN]

Jeroen Joannes Maria De Goeij 1970 153 p refs In DUTCH
(NP-18592) Avail: AEC Depository Libraries

A method for determination of oxygen by indirect neutron activitation is described. The sample is mixed with Li-6, which produces tritons by neutron capture. Subsequently the tritons interact with O-16 giving radioactive F-18. Physical factors that may influence the accuracy and sensitivity of the triton activation of oxygen are considered. The practical aspects and usefulness of triton activation are discussed. NSA

N72-10615# Heidelberg Univ. (West Germany).

ANGULAR DISTRIBUTION IN THE BETA DECAY OF XI(MINUS) HYPERON [WINKELVERTEILUNGEN BEIM BETA-ZERFALL DES XI(MINUS) HYPERON]

H. W. Siebert Oct. 1970 51 p refs In GERMAN; ENGLISH summary
(BMBW-FBK-70-16) Avail: AEC Depository Libraries

The beta-decay of Xi(-) hyperon in flight was observed in a spark chamber experiment. A complete kinematic reconstruction of the observed decays was impossible due to the lack of a magnetic field for momentum determination. It is shown that an analysis of the angular distributions of the decay products yields information on the ratio g sub A/g sub V in two different ways. From 13 Xi(-) hyperon-beta decays an electron antineutrino asymmetry -0.25 + or -1.0 is found for the decay Xi(-) hyperon yields Lambda hyperon electron antineutrino. The error results from the small sample size. For the production reaction kaon(-)(1.65 GeV/c) + proton yields Xi(-) hyperon + kaon(+) a Xi(-) hyperon polarization 0.33 + or - 0.5 is found. Author (NSA)

N72-10616# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).

PRELIMINARY RESULTS ON COINCIDENCE MEASUREMENTS FOR ELECTROPRODUCTION IN THE DEEP INELASTIC REGION

F. W. Brasse, W. Fehrenback, W. Flauger, K. H. Frank, J. Gayler, V. Korbel, J. May, P. D. Zimmerman, and E. Ganssauge Apr. 1971 13 p refs
(DESY-71/19) Avail: AEC Depository Libraries

In the deep inelastic region of electroproduction, coincidence measurements were made for the reactions e + p yields e + p + M sub x and e + p yields e + pion(+) + M sub y. Preliminary results for the production cross sections second derivative of sigma with respect to Omega hyperon P sub p,pion and second derivative of sigma with respect to Omega hyperon M sub x,y, by virtual photons, are given. Author (NSA)

N72-10617# Danish Atomic Energy Commission, Risoe. Accelerator Dept.

THE 10 MeV BREMSSTRAHLUNG CONVERTER

Johnny D. Hansen Apr. 1971 15 p refs
(RISO-M-1261) Avail: AEC Depository Libraries

A 10 MeV 5 kW bremsstrahlung converter with a water cooled tungsten target for the production X-rays by stopping high-energy electrons from Risoe's 10 MeV linear accelerator is described. Calculations for the tungsten target are given. Author (NSA)

N72-10618# Commissariat a l'Energie Atomique, Grenoble (France).

EQUIPMENT DEVELOPMENT FOR MEASURING THE DENSITY DISTRIBUTION IN AN ELECTRON BEAM PRODUCED BY AN ELECTROSTATIC ACCELERATOR. MODIFICATION OF A 2-MV, 300-MU A VAN DE GRAAFF GENERATOR TO PRODUCE A LARGE CROSS SECTION BEAM [ETUDE ET REALISATION D'UN DISPOSITIF DESTINE A LA MESURE DE LA DISTRIBUTION DE DENSITE DU FAISCEAU D'ELECTRONS PRODUIT PAR UN ACCELERATEUR ELECTROSTATIQUE. ADAPTATION D'UN ACCELERATEUR VAN DE GRAAFF DE 2 MV, 300 MU A A LA PRODUCTION D'UN FAISCEAU D'ELECTRONS DE FORTE SECTION]

Henri Cortial Mar. 1971 91 p refs In FRENCH
(CEA-R-4153) Avail: AEC Depository Libraries

The principles and development of an electron beam analyzing apparatus are discussed (energies up to 2 MeV). The essential features are: radiative cooling, the lack of cooling fluid, an easily interchangeable electron capture assembly, which can be adapted to various types of measurement and a scanning speed which is variable over a large range. Beam localization with respect to the target and continuous quantitative analysis are simultaneously possible at any point in the beam. The development of an electron gun and the fundamental features of the prototype are discussed including absence of aberrations at the input; a controllable beam diameter; a current exceeding 30 mA; and a high yield without spraying from the extraction electrode. When this prototype is used with a 2 MeV, 300 micorampere Van de Graaff generator the exit diameter varies between 20 and 30 mm for a focusing voltage between 100 and 200 V. Author (NSA)

N72-10619# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.

NEUTRON-RICH ISOTOPES OF LIGHT ELEMENTS PRODUCED IN TRANSFER REACTIONS WITH HEAVY IONS

A. G. Artyukh, V. V. Avdeichikov, G. F. Gridnev, J. Eroe, V. L. Mikheev, V. V. Volkov, and J. Wilczynski 1970 24 p refs
Presented at Conf. on the Properties of Nuclei Far from the Region of Beta Stability, Leysin, Switzerland, 31 Aug. - 4 Sep. 1970
(JINR-E7-5319; Conf-700815-5) Avail: AEC Depository Libraries

Eleven new isotopes of carbon, nitrogen, oxygen, fluorine, and neon, and all the known heaviest isotopes of helium, lithium, beryllium, and boron were obtained. Evidence for particle instability of Be-13 and Be-14 was obtained. For identification, a method was used which combines a magnetic analysis and dE/dx, E technique. Author (NSA)

N72-10620# Institute of Technology, Helsinki (Finland). Dept. of Technical Physics.

THE USE OF NUCLEAR POLARIZATION IN NEUTRON SCATTERING AND TRANSMISSION MEASUREMENTS

O. J. A. Tiainen, M. Anttila, and E. Tunkelo 1 Oct. 1970 13 p refs
(TKK-F-A-123) Avail: AEC Depository Libraries

The use of nuclear polarized targets in connection with a polarization spectrometer, and measurements of scattering lengths, b sub + and b sub -, for two different resultant spin states of the neutron and the target nucleus are discussed. The depolarization of the neutron beam was calculated in some special cases. It can be concluded that the use of polarized targets with a polarization spectrometer may be useful in separation of a weak coherent-scattering component from an incoherent background. The measurements of the spin dependence of thermal absorption and the scattering lengths, b sub + and b sub -, by using brute-force polarization of the target seem to be promising in experiments with nuclei having short enough spin-lattice relaxation times. Author (NSA)

N72-10621# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

USES OF THE CLASSICAL APPROXIMATION IN QUANTUM ELECTRODYNAMICS Ph.D. Thesis - Paris Univ. [APPLICATIONS DE L'APPROXIMATION CLASSIQUE EN ELECTRODYNAMIQUE QUANTIQUE]

Edouard Brezin Feb. 1971 108 p refs In FRENCH
(CEA-R-4142) Avail: AEC Depository Libraries

Approximations commonly used in the study of the classical limit of quantum mechanics are applied, with justification, to quantum electrodynamics. First, the infrared divergence in the scattering of two charged particles is examined with the help of a series of Feynman diagrams, which in particular preserves gauge invariance and a correct static limit. Looking for the poles in energy of the scattering amplitude, a formula for the binding energies of two charged particles, which generalizes the Balmer formula and takes into account the correct relativistic kinematics, was derived. A second type of application concerns phenomena due to the interaction of the electromagnetic field with the vacuum-current and charge fluctuations. The creation rate is known in the limit of static fields, and the aim of these calculations was to demonstrate the role of frequency in the domain starting from the lowest frequencies up to X-rays. The pair production rate was found to be entirely negligible, even for the most intense laser beams. An increase in frequency, even up to several tens of keV, did not have any effect on the pair production. Author (NSA)

N72-10622# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

ALGEBRAIC AND ANALYTIC PROPERTIES OF THE n-POINT FUNCTION IN QUANTUM FIELD THEORY Ph.D. Thesis - Paris Univ. [PROPRIETES ALGEBRIQUES ET ANALYTIQUES DE LA FONCTION DE N POINTS EN THEORIE QUANTIQUE DES CHAMPS]

Jacques Bros Apr. 1971 127 p refs In FRENCH
(CEA-R-4187) Avail: AEC Depository Libraries

The general theory of quantized fields (axiomatic approach) is investigated. A systematic study of the algebraic properties of all the Green functions of a local field, which generalize the ordinary retarded and advanced functions, is presented. The notion emerges of a primitive analytic domain of the n-point function, and of the existence of auxiliary analytic functions into which the various Green functions can be decomposed. Certain processes of analytic completion are described, and then applied to enlarging the primitive domain, particularly for the case n = 4. The crossing property for all scattering amplitudes, which involve two incoming and two outgoing particles, is proved. Author (NSA)

N72-10623# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.

DEVELOPMENT OF A FOUR CRYSTAL MONOCHROMATOR AND A ROTATING MINIATURE COLLIMATOR FOR NEUTRON SPECTROSCOPY

R. Stockmeyer Dec. 1970 27 p refs In GERMAN
(JUL-719-FF) Avail: AEC Depository Libraries

A multicrystal monochromator and a miniature rotating collimator were developed for use with the time-of-flight spectrometer SV5c. The miniature collimator built for a chopper with short opening time can be used for triaxial spectrometers and double monochromators. The intensity yield factor 8.6 for the multicrystal monochromator can not be expected for the very broad beam of the SV5c time-of-flight spectrometer. It was established, however, that the monochromatic beam can be focused with 10 crystals such that the spectrometer yields measurements with better resolution at the same intensity in a large angular range than is possible without the multicrystal monochromator. Author (NSA)

N72-10624# Atomic Energy Establishment, Cairo (Egypt). Reactor and Neutron Physics Dept.

MEASUREMENT OF CONTINUOUS FAST NEUTRON SPECTRA BY SCINTILLATION TECHNIQUE

R. Megahid, A. S. Makarious, S. Belov, and I. Hamouda 1970 25 p refs
(UARAEE-91) Avail: AEC Depository Libraries

A fast neutron scintillation spectrometer with stilbene crystal was assembled, adjusted, and calibrated to measure continuous fast neutron spectra in the energy range 1 to 11 MeV. Insensitivity to gamma rays and electrons was achieved by utilizing differences in the pulse shapes of light pulses produced by electrons and protons. To check the working efficiency of the spectrometer as well as the energy scale and handling method used, the neutron spectra of a Po-alpha-Be source and the direct neutron spectrum from a horizontal beam channel of the UA-RR-1 after passing through graphite filters of 18 and 50 cm thickness were measured. A reasonable agreement with other measurements was obtained. The spectrum of the fast neutrons of the reactor beam was compared with an available calculation of the leakage neutron spectrum. After introduction of a number of experimental corrections both spectra were found to be in good agreement. Author (NSA)

N72-10625# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.

PSEUDO-NOISE SEQUENCE APPLICABLE TO MULTIPLEX SYSTEMS OF PARTICLE DETECTION

L. M. Soroko 1971 15 p refs In RUSSIAN
(JINR-P13-5722) Avail: AEC Depository Libraries

The properties of pseudonoise sequences used in the multiplex systems of particle detection are presented. The method for the generation of pseudonoise sequences using the Hadamard matrix is given. The performance of the pseudonoise sequences is discussed in the terms of the discrete Fourier transform. The multiplex systems of the particle detection are useful from the economical point of view, if the limit of the equipment is the background error. Author (NSA)

N72-10626# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Div.

REVISED POSITION SENSITIVE DETECTOR ARRAY FOR A CHARGED PARTICLE SPECTROGRAPH

G. V. Ansell Mar. 1971 8 p refs
(AERE-R-6776; HL71/1644(C.8)) Avail: AEC Depository Libraries; HMSO 9p

A modified position sensitive detector array (surface-barrier detectors) associated with a broad range spectrograph is described. The arrangement enables a continuous spectrum to be obtained. Author (NSA)

N72-10627# Japan Atomic Energy Research Inst., Tokyo.

IMPURITIES IN PROCESSED RADIOISOTOPES PRODUCED BY THE (n, GAMMA) REACTION: PURITY OF Yb-169

M. Kubota and H. Amano Jan. 1971 15 p refs In JAPANESE; ENGLISH summary
(JAERI-Memo-4279) Avail: AEC Depository Libraries

Impurities in ytterbium oxide were determined in order to estimate the radiochemical purity of Yb-169 that is to be produced by neutron irradiation. Impurities of 0.036 ppM Sc. 2.8 ppM Tm, 8.6 ppM Tb, and 7.2 ppM Eu were found in the ytterbium oxide by radioactivation analysis combined with ion-exchange separation. In spite of this high purity of the target material, the radiochemical purity of Yb-169 when irradiated for 130 hours in a neutron flux does not exceed 1.7 percent at the end of cooling for 24 hours after irradiation because of the formation of Yb-175. Cooling for about 105 days is necessary to allow decay of the Yb-175 and Lu-177 formed from the beta disintegration of Yb-177, and to raise radiochemical purity of Yb-169 to 99.9 percent. The specific activity of the product thus obtained found to be 0.16 Ci/g Yb. Author (NSA)

N72-10628# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.

SYNCHRONIZED CHOPPER TIME-OF-FLIGHT SPECTROMETER AT THE DUBNA PULSED REACTOR IBR-30

S. Dema, J. Horvath, N. Kroo, F. Szlavik, and G. Zsigmond 1971 31 p refs
(JINR-E14-5731) Avail: AEC Depository Libraries

A time of flight spectrometer was constructed at the pulsed reactor in Dubna. The spectrometer works in the direct geometry with a phased chopper before the sample. The energy of the incoming neutrons can be varied in the 3 to 130 MeV range. Scattered neutrons can be analyzed simultaneously in 8 angles covering about 10 deg wide angular region. By moving the detector arm + or - 65 deg scattering angle region can be covered. Author (NSA)

N72-10629# European Organization for Nuclear Research, Geneva (Switzerland).

RELATIVISTIC INCREASE OF IONIZATION AND SENSITIVITY OF NUCLEAR EMULSIONS

V. K. Ermilova, L. P. Kotenko, and G. I. Merzon Mar. 1971 26 p refs Transl. into ENGLISH from Russian Report
(CERN-Trans-71-9) Avail: AEC Depository Libraries

A quantitative explanation is given of the value found by experiment and the energy dependence of the track density of relativistic particles in a nuclear emulsion, based on the peculiarities of the ionization process for silver bromide and on the physico-chemical structure of emulsion. An understanding of these points is important for the identification of high energy particles in nuclear emulsions, and also for an explanation of the activation mechanism of AgBr microcrystals. Author (NSA)

N72-10630# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.

ELECTROMAGNETIC SEPARATION OF SHORT-LIVED ISOTOPES OF Rn, Xe, AND Kr FOR SPECTROSCOPIC STUDIES

V. P. Afanasev, I. I. Gromova, D. Monchka, and V. J. Raiko 1971 13 p refs In RUSSIAN
(JINR-P13-5767) Avail: AEC Depository Libraries

A technique for separating the short-lived Rn, Xe and Kr isotopes is described. The values of the separation efficiencies are given. The obtained isotopes were used in studies of alpha and beta decay and gamma radiation of these isotopes. Author (NSA)

N72-10631# Japan Atomic Energy Research Inst., Tokyo.

THE DIVISION OF RADIOISOTOPE PRODUCTION Annual Technical Progress Report, fiscal year 1969

Jan. 1971 60 p refs In JAPANESE
(JAERI-Memo-4285; ATPR-3) Avail: AEC Depository Libraries

The annual progress reports of technical developments in the Division of Radioisotopes Production for 1969 are summarized. Isotope production, processed isotopes, radiation sources, fission products, etc. are described. Author (NSA)

N72-10632# Hahn-Meitner-Institut fur Kernforschung, Berlin (West Germany).

NUCLEAR CHEMISTRY COMPENDIUM. PART 1: NUCLEAR RADIATION MEASUREMENT TECHNIQUE [KERNCHEMISCHES KOMPENDIUM. TEIL 1: KERNSTRAHLUNGS - MESSMETHODIK]

P. Moeller and K. E. Zimen Apr. 1971 137 p refs In GERMAN
(HMI-B-108; B-C54) Avail: AEC Depository Libraries

The background material on nuclear radiation measurement techniques used in a nuclear chemistry course is presented. Corrections in counter measurements, statistical scattering and measurement error in counter measurements, measurement of half lives, measurement of decay rates, gamma spectrometry, and autoradiography are considered. The special measurement problems of soft beta emitters and of very weak activities are discussed separately. Detector comparison and the selection of the measurement method are considered. NSA

N72-10633# Norges Landbrukshoegskole, Vollebekk. Dept. of Mathematics.

KINEMATICS OF MULTIPARTICLE FINAL STATES IN HIGH ENERGY REACTIONS

Per Nyborg Nov. 1969 127 p refs
(NP-18756) Avail: AEC Depository Libraries

Multiparticle final states are described in terms of invariant masses, invariant momentum transfers, and angles. The major part is concerned with description of n-particle phase space in terms of 2n-3 invariant variables and n-1 azimuthal angles. For n = 3, 4, and 5, explicit expressions for a large number of phase space projections are established. The emphasis is on explicit expressions and alternative descriptions that may be useful for experimentalists. The various complete descriptions of phase space in terms of 3n-4 independent variables are suitable for Monte Carlo calculations. The partially integrated forms may be used to simplify the evaluation of normalization integrals in a maximum likelihood analysis. The various descriptions involve different reference frames. Author (NSA)

N72-10634# Australian National Univ., Canberra. Dept. of Theoretical Physics.

COMPUTER SUBPROGRAMS FOR SCATTERING PROBLEMS

P. B. Treacy 1969 9 p refs
(ANU-P-439) Avail: AEC Depository Libraries

Transcendental functions in FORTRAN 4 (E) for an IBM 360/50 are described. Several subprograms are described for the Born approximation with Yukawa potential including gamma function for complex argument; psi-function for complex argument; Gaussian hypergeometric function for real argument and complex parameters; and the Gaussian hypergeometric function in the logarithmic case. Other programs are discussed for potential scattering with complex angular momentum including ingoing and outgoing Coulomb wave functions for complex angular momentum; Coulomb function regular at the origin; Whittaker function for real argument; and Basset function for real argument. NSA

N72-10635# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

POTENTIAL WELL DEPTH IN THE TWO-CENTER MODEL FOR HEAVY ION SCATTERING

Christian Toepffer 1971 8 p refs
(JINR-E4-5767) Avail: AEC Depository Libraries

It is shown that the two-center shell model for fast collisions between nuclei gives correct values for the compression energy, if the variation of the potential wells with the compression of nuclear matter is taken into account properly. Author (NSA)

N72-10636# Bose Research Inst., Calcutta (India).

THE BOSE INSTITUTE Annual Report, 1968 - 1969

1969 174 p refs
(NP-18712) Avail: AEC Depository Libraries

Mutants of spinach, garden peas, and fennel induced by seed exposure to various doses of X-radiation were examined for changes in the rate of seed germintation, growth rate, crop yield, morphology, and plant survival. Mutants of Aspergillus chevalieri yielding antibiotic were derived from spore exposure to doses of 10, 20, 30, and 40 Kr gamma radiation, with increased antibiotic potency in mutants induced by lower doses. Results are reported from studies on the antibiotic and fungistatic properties of a number of fungi. The cross section for the (n,2n) reaction with fifteen nuclides from F-19 to Pr-141 are are given at 14.8 MeV; cross sections for ten of these were also measured at 14.2 MeV. The electron charge distributions of Sn and Pb were calculated; the cross sections for pair production at different angles were also measured. J.A.M.

N72-10637# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.

A THEORETICAL STUDY OF THE STRUCTURE OF ATOMIC COLLISION CASCADES. PART 1: METHOD OF ANALYSIS

G. A. Wheeler and R. L. Woolley Mar. 1971 35 p refs
(RD/B/N-1915) Avail: AEC Depository Libraries

Computer programs were written to investigate the production and structure of cascades started by ions of tens of keV in amorphous monatomic solids. From the programs the number of the defects in the cascade and their distribution in the solid can be determined, and the properties of ions transmitted by foils and sputtered from solid surfaces can be obtained. Author (NSA)

N72-10638# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
A THEORETICAL STUDY OF THE STRUCTURE OF ATOMIC COLLISION CASCADES. PART 2: CASCADES DERIVED FROM THE THOMAS-FERMI POTENTIAL
G. A. Wheeler May 1971 49 p refs
(RD/B/N-1916) Avail: AEC Depository Libraries

An interatomic potential based upon the Thomas-Fermi model of the atom was used to calculate the amount and distribution of the damage due to collision cascades started by primary ions with tens of keV kinetic energy in carbon, iron, and uranium. The energy and angular distributions of the knocked-on atoms in the cascade also define the properties of ions that are transmitted through thin foils and sputtered from solid surfaces.
Author (NSA)

N72-10639# European Organization for Nuclear Research, Geneva (Switzerland).
COMPILATION OF CROSS SECTIONS. 2: ANTIPROTON INDUCED REACTIONS
E. Flaminio, J. D. Hansen, D. R. O. Morrison, and N. Tovey Nov. 1970 113 p refs
(CERN-HERA-70-3) Avail: AEC Depository Libraries

A compilation of cross sections of reactions produced by antiprotons on targets of protons, neutrons, and deuterons is presented. Graphs of the variation of cross section with incident laboratory momentum are plotted. Values for the rate of decrease of cross section with incident momentum are given.
Author (NSA)

N72-10640# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
DESCRIPTION OF THE REACTIONS OF GENERAL TYPE AND THE SHELL MODEL
B. N. Zakharev and Yu. I. Fenin 19 Oct. 1971 12 p refs In RUSSIAN
(JINR-P4-5678) Avail: AEC Depository Libraries

A description of reactions is suggested, in which a proper formulation of scattering-problem boundary conditions is combined with the expansion of wave functions of the whole system usually exploited in the ordinary shell model (bound states of nuclei). This allows similar calculation techniques for the problems of discrete and continuous spectra. Author (NASA)

N72-10641# Institute of Nuclear Research, Warsaw (Poland).
RELATIVE K-CAPTURE PROBABILITY IN THE UNIQUE FIRST FORBIDDEN DECAY OF Sm-145
B. Myslek, B. Pietrzyk, Z. Sujkowski, and J. Szczepankowski 1970 16 p refs Submitted for publication
(INR-P-1235) Avail: AEC Depository Libraries

The relative K-capture probability, P sub K, for the unique first forbidden decay of Sm-145 to the 492.3-keV level in Pm-145 was measured by the coincidence method to be P sub K = 0.27 + or - 0.03. This is compared with the theoretical values P sub K (allowed) = 0.70 + or - 0.03 and P sub K (unique forbidden) = 0.19 + 0.06 or -0.05 calculated using the experimental decay energy Q = 115 + or - 10 keV.
Author (NSA)

N72-10642# Institute of Nuclear Research, Warsaw (Poland).
LEVELS OF Th-230 AND U-230 FED IN THE DECAY OF Pa-230
W. Kurcewicz, K. Stryczniewicz, J. Zylicz, S. Chojnacki, T. Morek, and I. Yutlandov 1970 41 p refs
(INR-P-1251) Avail: AEC Depository Libraries

The Pa-230 decay to levels of Th-230 and U-230 was investigated using Si(Li) and Ge(Li) spectrometers for singlet spectra measurements, and a Ge(Li) spectrometer combined with six-gap beta spectrometer or with a Na(Tl) detector for coincidence measurements. A decay scheme is reported. This scheme accounts for all but one of the 50 internal transitions observed. The Pa-230 yields Th-230 decay energy was determined at Q sub EC = 1315+15 or -10 keV. For U-230, the first excited 2(+) state was observed at 51.72 keV and the bandhead state of the K(pi) = 0(-) octupole band was proposed at 366.5 keV. The experimental data are discussed in terms of nuclear models, with emphasis on the problem of band-mixing effects.
Author (NSA)

N72-10643# Danish Atomic Energy Commission, Risoe.
LEVEL DIAGRAM OF Yb-175 AND A MEASUREMENT OF THE LOW-ENERGY Au-197(n,GAMMA)-SPECTRUM Ph.D. Thesis - Munich Univ. [DAS KERNNIVEAUSCHEMA VON Yb-175 UND MESSUNG DES NIEDERENERGETISCHEN Au-197(n,GAMMA)-SPEKTRUMS]
Hanns-Dieter Breitig Feb. 1971 88 p refs In GERMAN
(RISO-M-1308) Avail: AEC Depository Libraries

The (Yu-74)(neutron, gamma) spectrum was measured in the energy region of 26 - 1500 keV. More than half the observed 129 gamma lines were placed in a level scheme. Precise energies were determined for the states, and their de-excitation was studied. Calculations show that these bands mix strongly through Coriolis coupling. Additional and previously unknown states of the (624) and (633) bands are proposed. Level energies and gamma branching ratios are explained through a multiband mixing calculation of the configurations with negative parity. In a measurement of the neutron-capture spectrum of Au-197, 500 lines were found in the energy region of 1000-30 keV. Fifty-four of these lines are due to double capture. They allowed a confirmation of the Au-199 level scheme, known from the Pt-199 beta decay. Author (NSA)

N72-10644# Paris Univ., Orsay (France). Faculte des Sciences.
DEVELOPMENT OF A COINCIDENCE SYSTEM BETWEEN CHARGED PARTICLES AND GAMMA RAYS. APPLICATION TO THE STUDY OF GAMMA DEEXCITATION OF Ca-41 LOW ENERGY LEVELS Ph.D. Thesis [MISE AU POINT D'UN SYSTEME DE COINCIDENCE ENTRE PARTICULES CHARGEES ET RAYONNEMENT. APPLICATION A L'ETUDE DE LA DESEXCITATION GAMMA DE NIVEAUX DE BASSE ENERGIE DU Ca-41]
Serge Cohen [1971] 47 p refs In FRENCH
(NP-18854) Avail: AEC Depository Libraries

A gamma-charged particle coincidence system was developed using a magnetic spectrometer. The gamma spectra obtained enabled the branching ratios of the following ten excited levels of Ca-41 to be determined: 3200, 3369, 3400, 3495, 3527, 3614, 3676, 3730, 3845, and 3976. Spins and parities were proposed for some of them. NSA

N72-10645# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.
TECHNICAL STUDY OF A SUPERCONDUCTING QUADRUPOLAR COIL [ETUDE TECHNIQUE DU LACET QUADRUPOLAIRE SUPRACONDUCTEUR]
P. Asesio, A. Berruyer, G. Bronca, R. DeiCas, M. Hamang, F. Hennion, J. Tachon, and F. P. G. Valckx Feb. 1971 82 p refs In FRENCH; ENGLISH summary
(EUR-CEA-FC-580; Dph-PEC-SCP) Avail: AEC Depository Libraries

The technical project of the superconducting coil and cryogenic installation for the experiment of multi-injection of fast neutrons in a quadrupolar coil is presented. The complete experiment is briefly described. NSA

N72-10646# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.
EFFECT OF GAMMA RADIATION ON SORPTION PROPERTIES OF ISOMORPHOUS CALCIUM BARIUM SULPHATE: A SELECTIVE SORBENT FOR Sr IONS [VLIV ZARENI GAMA NA SORPCNI SCHOPNOST ISOMORFNIHO SIRANU VAPENATO-BARNATEHO SELEKTIVNIHO SORBENTU PRO Sr IONTY]
O. Vojtech and J. Moravec 1970 14 p refs In

CZECHOSLOVAKIAN
(UJV-2415-Ch) Avail: AEC Depository Libraries

Selective sorbents for Sr ions based on isomorphous metastable calcium barium sulfates were found to decompose under the influence of high gamma radiation doses to the original components. The CaSO4 thus formed reacted with water; the absorption band in the IR spectrum region of the resulting hemihydrate was used for a quantitative investigation of the radiolysis. With increasing dose (up to 10 to the 9th power rad) the sorption efficiency for Sr decreased. This was evidenced by a decrease both in the maximum amount sorbed and in the sorption rate. NSA

N72-10647# Grenoble Univ. (France).

[CYCLOTRON EQUIPMENT AND RADIOACTIVE STUDIES] Annual Report, 1970

1970 148 p refs In FRENCH
(NP-18868; ISN-1970) Avail: AEC Depository Libraries

The cyclotron and its equipment, experiments made with it, radioactivity studies, experiments made in collaborations with other laboratories, and theoretical nuclear studies are received. NSA

N72-10648# Strasbourg Univ. (France). Faculte des Sciences.

INVESTIGATION OF RADIATION DETECTORS OBTAINED BY ION IMPLANTATION Ph.D. Thesis [ETUDE DES DETECTEURS DE RAYONNEMENTS NUCLEAIRES OBTENUS PAR IMPLANTATION D'IONS]

Philippe Sebillotte 1970 97 p refs In FRENCH
(NP-18897) Avail: AEC Depository Libraries

Ion implantation techniques are studied in view of developing nuclear radiation detectors and also for studying heavy ion interactions with matter. Nuclear radiation detectors were obtained by bombarding n-type Si targets of various crystalline orientations with 15 keV boron ions. The physical mechanisms leading to the slowing down of low energy incident ions in amorphous and crystalline targets (B, P, and Sb ions in Si, Ge, and CdTe targets) were studied. Theories of ion-matter interaction processes are developed. The accelerator and the ion source constructed for ion implantations in crystalline semiconductors are described. The characteristics of implanted and annealed diodes are given. A method for measuring the window thickness is presented. The changes in window thickness with temperature, initial material resistivity, dose, and implantation direction are discussed. The distribution of implanted impurities in Si P-N junctions is deduced. NSA

N72-10649# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.

RESPONSE OF IMPURITY ACTIVATED ALKALI HALIDES SCINTILLATORS TO IONIZING PARTICLES

M. Ladu and M. Roccella 10 Dec. 1970 14 p refs *Its* Note no. 496
(LNF-70/53) Avail: AEC Depository Libraries

The response of NaI(Tl) to energetic heavy ions was calculated to be in good agreement with previous experimental data, but a noticeable disagreement was observed for light ions like alpha particles. A model is proposed to interpret the response of impurity- activated alkali halides where the mechanism of energy transfer by means of exciton diffusion is taken into account. If the exciton mean free path lambda is approximately 0.000001 cm at an impurity concentration of about 0.1%, a satisfactory interpretation is given of NaI(Tl) response to alpha particles, protons, and deuterons as well as to heavier ions. It is shown that the response to the latter is quite unaffected by exciton diffusion. The characteristic dose is expressed in terms of gamma; which gives a law of dependence of luminescence efficiency to gamma rays on impurity concentration that is in agreement with experiment. Author (NSA)

N72-10650# Bhabha Atomic Research Centre, Bombay (India).

POST-IRRADIATION THERMAL RELEASE STUDY OF FISSION GASES FROM FUEL PELLETS

O. P. Chawla, M. C. Naik, and M. D. Karkhanavala 1971 17 p refs
(BARC-538) Avail: AEC Depository Libraries

The design and construction of an apparatus for the study of post-irradiation release of xenon and krypton fission gases from irradiated fuel pellets in the temperature range from room temperature to 1100 C are described. A simple sweep gas method was used but the design also permits the use of a closed-loop forced circulation method when necessary. The activity due to the released fission gases is measured by gamma ray spectrometry. The system was used to measure Xe-release from irradiated ThO2-0.1% U(235)O2 solid solutions. Author (NSA)

N72-10651# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

EXOELECTRON EMISSION FROM CALCIUM SULPHATE DOPED WITH DIFFERENT CONCENTRATIONS OF Sm, Mn, Pb

E. Rotondi 24 Sep. 1970 24 p refs Presented at the 3d Intern. Symp. on Exoelectrons, Brunswick, 6-8 Jul. 1970
(RT/FI-(70)41; Conf-700715-4) Avail: AEC Depository Libraries

Exoelectron glow-curves of pure CaSO4 showed four peaks at the following temperatures: 125 C, 177 C, 275 C, 365 C. The analysis carried out on calcium sulfate doped with Sm, Mn, and Pb indicated that these activators, though not essential for the exoelectron emission play an important role in the exoemission efficiency and peak areas. A comparison with thermoluminescence properties of the same substance would indicate that both processes are generated by the same electron trapping center. Effects of alpha particles on exoemission glow curves are presented. Author (NSA)

N72-10652# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

POLARIZATION OF PHOTONS SCATTERED BY ATOMIC RAMAN EFFECT

J. Oxenius and P. Platz Apr. 1971 16 p refs
(EUR-CEA-FC-594) Avail: AEC Depository Libraries

The polarization of photons scattered by atomic Raman effect in the direction perpendicular to the polarization vector of the incident photons was studied, assuming that Raman scattering takes place via quasi-resonant atomic states. Detailed calculations were carried out for three cases of atomic Raman scattering that were observed experimentally, for K, H, and Hg. NSA

N72-10653# Paris Univ. (France). Faculte des Sciences.

PRINCIPAL CHARACTERISTICS OF THE REACTIONS PION(PLUS) PROTON YIELDS PROTON PION(PLUS) PION(0) AND PION(PLUS) PROTON YIELDS PROTON PION(PLUS) ETA(0) MESON AT 5 GeV/c. ANALYSIS OF THE PRODUCTIONS DELTA HYPERON PION, DELTA(PLUS PLUS) HYPERON ETA(0) MESON AND PROTON RHO(PLUS) MESON Ph.D. Thesis

Bernard Chaurand [1971] 120 p refs In FRENCH
(NP-18882) Avail: AEC Depository Libraries

The elastic events satisfied the proton pion(+) pion(0) hypothesis. The optical theorem and the total cross sections were used together to obtain the normalized cross sections. In the qausi-two-body reactions, the only part of the Dalitz diagram used is that corresponding to a negative Cos(theta) for the dipion. The contribution of multiperipheral events to this half of the Dalitz diagram is negligible. A single experiment was sufficient to measure the whole spectrum in t for pion(+) proton yields pion(+) proton. Results obtained for pion(+) proton yields Delta hyperon(+) pion(0) are consistent with the theory; a significant minimum was observed at 0.8 Ge(V squared) but not backward peak. The agreement with the theory is good for pion(+) proton yields Delta hyperon(++) eta meson(0), though a significant forward minimum is observed. The agreement with the Regge pole model is mediocre especially for large transfers. NSA

N72-10654# Paris Univ., Orsay (France). Faculte des Sciences.
INVESTIGATION OF HIGH-MULTIPLICITY EVENTS IN KAON(MINUS) PROTON INTERACTIONS AT 3.9 GeV/c. GOLDHABER EFFECT Ph.D. Thesis [ETUDE DES HAUTES MULTIPLICITES DANS LES INTERACTIONS KAON(MINUS) PROTON A 3.9 GEV/C. EFFET GOLDHABER]
Daniel Andriamasy 1970 100 p In FRENCH
(NP-18879) Avail: AEC Depository Libraries

A phenomemological study was made of high-multiplicity events (six pronged events) in kaon(-) proton interactions. The experiment was carried out with the M4 beam of the CERN synchrotron and the 2m bubble chamber filled with hydrogen. The cross sections were calculated for the channels with six particles or more. The production mechanisms were studied for three channels. No evidence of asymmetry indicating exchange mechanisms was obtained. A parametrization involving only three parameters was developed for the kaon(-) proton 4 pi channel. The percentage of resonance production was studied. It is shown that the Goldhaber effect does not arise exclusively from resonances, pion symmetrization, or from exchange mechanisms. Author (NSA)

N72-10655# Kernforschungsanlage, Juelich (West Germany). Institut fuer Neutronenphysik.
ION-OPTICAL PROPERTIES OF FOCUSING PARABOLIC SPECTROGRAPH SUITABLE FOR THE SEPARATION OF NONDECELERATED FISSION PRODUCTS
G. Fiebig, H. Lawin, and H. Wollnik Nov. 1970 93 p refs In GERMAN
(JUL-713-NP) Avail: AEC Depository Libraries

Three-dimensional particle orbits for a focusing parabolic spectrograph consisting of an homogeneous magnetic sector field and an electrostatic cylindrical condenser are derived using the method of transfer matrices in a second order calculation with inclusion of the scattering field effect. The ion-optical properties of the device are described. Special emphasis is given to the calculation of the second order image errors as linear functions of the free optional curvatures of the four field boundaries. With these image errors, a limit was then set for the mass and energy resolutions obtainable, in which an image plane is assumed perpendicular to the principal orbit. NSA

N72-10656# Paris Univ., Orsay (France). Faculte de Sciences.
STUDY OF THE PION (PLUS) PROTON YIELDS RHO(0) MESON DELTA HYPERON DELTA (PLUS PLUS) HYPERON REACTION AT 11.7 GeV/c Ph.D. Thesis
Maryse Chaumet [1970] 82 p refs In FRENCH
(NP-18881) Avail: AEC Depository Libraries

The quasi two body reaction pion(+) proton yields rho meson(0) Delta hyperon(++) was studied, and the production and decay mechanism investigated. Data obtained from a liquid hydrogen bubble chamber experiment using an 11.7 GeV/c pion(+) beam were used. The total cross section of the pion(+) proton yields rho meson(0) Delta hyperon(++) channel is calculated using a two dimensional mass distribution and assuming a peripheral phase space background. The differential cross section shows a very peripheral production corresponding to a very steep slope. The spin density matrix elements obtained at 11.7 GeV/c are fairly similar to those obtained at other energies. Results are explained using a Regge pole model in the s channel. The analysis is independent of the Regge model used, and enables the dominance of the pion pole exchange in the range of transfer momentum envisaged to be determined. An explanation of the peak in the forward differential cross section is presented. The model of Le Bellac is reconsidered on the basis of a model in the t channel taking into account explicitly the width of Delta hyperon(++) and rho meson(0) resonances. NSA

N72-10657# Clermont-Ferrand Univ. (France). Faculte des Sciences.
SCATTERING OF pi-MESONS BY C-12 NEAR THE (3/2,3/2,) PION-NUCLEON RESONANCE Ph.D. Thesis [DIFFUSION DES MESONS PI SUR NOYAUX DE CARBONE 12 AUTOUR DE LA RESONANCE (3/2, 3/2) PION-NUCLEON]
Lionel Hugon 1970 178 p refs In FRENCH
(NP-18889) Avail: AEC Depository Libraries

The apparatus utilizes an optical transfer device transferring the pions produced in the source into the experimental hall where a double achromatic spectrometer is found. The double spectrometric calculations were made considering aberrations up to the second order; these aberrations were reduced using sextupoles. A resolution higher than .001 was obtained. The measurement methods and the data processing are described. The Kisslinger form was established from the optical potential theory using the Lippman-Schwinger formalism. It was shown that the Klein-Gordon equation with such a potential is analytically integrable in the case of square well nuclear distribution. This analysis is entirely phenomenological and includes five independent parameters. The results presented are compared with previous results obtained below 100 MeV and with theoretical predictions. The agreement is satisfactory for low energy measurements. NSA

N72-10658# Institut Atomnoi Energii, Moscow (USSR).
DEMETRA PROGRAM SET FOR CALCULATING PROBLEMS OF NEUTRON THERMALIZATION IN THE ONE DIMENSIONAL CELL OF A HETEROGENEOUS REACTOR BY THE QUASI DIFFUSION METHOD
G. Ya. Trukhanov 1970 132 p refs In RUSSIAN
(IAE-2010) Avail: AEC Depository Libraries

The quasi-diffusion method of solving the multivelocity kinetic equation of neutron transport is discussed. The DEMETRA program set is described. This set of programs makes it possible to use the quasi-diffusion method to solve thermalization problems in the one-dimensional multizone cell of a heterogeneous reactor. NSA

N72-10659# Philipps-Universitat, Marburg (West Germany). Inst. fuer Theoretische Physik.
RELATION BETWEEN FORM FACTORS AND BOOTSTRAP HYPOTHESIS [ZUM ZUSAMMENHANG ZWISCHEN FORM-FAKTOREN UND BOOTSTRAP-HYPOTHESE]
P. Rosenthal Bundesmin. fuer Bildung und Wiss. Oct. 1970 34 p refs In GERMAN; ENGLISH summary
(BMBW-FBK-70-21; DK-539.126.34) Avail: AEC Depository Libraries

Qualitative relations between electromagnetic form factors following from a simple pion bootstrap are briefly recapitulated in order to emphasize certain general aspects of the problem. Analytical properties of the bootstrap-form factor subsequently are discussed. Author (NSA)

N72-10660# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
INTERROGATIVES ABOUT NEUTRINOS
B. Pontecorvo 1970 25 p refs Presented at 15th Intern. Conf. on High Energy Phys., Kiev, Aug. 1970
(JINR-E1-5439; Conf-700806-50) Avail: AEC Depository Libraries

New experiments in neutrino physics and astrophysics are discussed. Author (NSA)

N72-10661# Brandeis Univ., Waltham, Mass. Dept. of Physics.
RESEARCH IN ELEMENTARY PARTICLE PHYSICS Technical Progress Report, 1 Sep. 1969 - 30 Apr. 1970
Lawrence Kirsch and Howard J. Schnitzer 31 May 1970 10 p refs
(Contract AT(30-1)-3178)
(TID-25571) Avail: NTIS

Research on theoretical and experimental properties of elementary particles at Brandeis University from September 1, 1969 to April 30, 1970 is reported briefly. A list of publications is included. NSA

N72-10662# Princeton Univ., N.J. Elementary Particles Lab.
MEASUREMENT OF THE NEUTRAL BRANCHING RATIOS OF THE ETA MESON
Malcolm T. Buttram 17 Aug. 1970 91 p refs
(Contract AT(30-1)-4159)
(PURC-4159-6; TR-2) Avail: NTIS

The eta neutral branching ratios were measured from the energy spectrum of single gamma rays in the eta rest frame. From a sample of 7200 eta-decay gamma rays momentum-analyzed in an optical spark chamber pair spectrometer, the branching ratios (eta meson yields gamma gamma/eta meson yields neutrals) = (53.5 + or - 1.8)%, (eta meson yields pion(0) pion(0) pion (0)/eta meson yields neutrals) = (43.9 + or - 1.9)%, (eta meson yields pion (0) gamma gamma/eta meson yields neutrals) = (2.6 + or - 2.4)% were determined under the assumption that no other neutral modes were significant. An estimate of possible systematic effects is included in the errors.
Author (NSA)

N72-10663# Princeton Univ., N.J. Elementary Particles Lab.
PRECISE MEASUREMENT OF THE K1(0)-K2(0) MASS DIFFERENCE Ph.D. Thesis
Lawrence R. Sulak 28 Sep. 1970 115 p refs
(Contracts AT(30-1)-2137; N00014-67-A-0151-0001)
(PURC-4159-9; TR-3) Avail: NTIS

The K1-K2 mass difference was measured by the gap method to high precision. This method is particularly insensitive to knowledge of the detection efficiency of the apparatus, the nuclear regeneration parameters, and the argument of eta (+ or -). The K2 beam flux is monitored by the K sub e3 decay rate. The measurement yields the absolute value of Del m = (0.534 + or - 0.006) 10 to the 10th power/sec. Expressed in units of the inverse K1 lifetime = 0.862 x 10 to the minus 10th power sec, the absolute value of del equals 0.460 + or - 0.005. This result, combined with other recent measuremetns for the argument of eta (+ or -) = 39 deg + or - 5 deg. Author (NSA)

N72-10664# California Univ., Berkeley. Lawrence Radiation Lab.
COMPILATION OF YN REACTIONS
Odette Benary, Naomi Barash-Schmidt, LeRoy R. Price, Arthur H. Rosenfeld, and Gideon Alexander (Tel Aviv Univ.) Jan. 1970 75 p refs Sponsored jointly by AEC and NBS
(UCRL-200000-YN) Avail: NTIS

Seventeen papers reporting Lambda hyperon p, Sigma hyperon(+) p, and Sigma hyperon(-) p interactions are presented. Cross sections, angular distributions, and polarizations are displayed. Indices to the papers are included, as well as a complete listing of the selected hyperon nucleon data.
Author (NSA)

N72-10665# Texas Univ., Austin. Center for Nuclear Studies.
QUANTITATIVE STUDIES OF NUCLEAR STRUCTURE THROUGH ISOBARIC ANALOG RESONANCES
S. Darmodjo, R. D. Alders, D. G. Martin, P. Dyer, S. Ali, and S. A. A. Zaidi [1971] 47 p
(ORO-2972-189) Avail: NTIS

Isobaric analog resonances (IAR) observed in the elastic scattering of protons from Pb-208, Ba-138, Sn-124, and SN-120 are analyzed in the framework of the shell-model theory of reactions. Parametrization of the energy-averaged S-matrix elements given by the shell-model theory is discussed, and the dependence of the spectroscopic factors upon the various optical model parameters is exhibited. The resonance mixing phases for most of the IAR analyzed cannot be distinguished from zero. Damping the single-particle wave functions arising from the nonlocality of the optical potentials is consistently incorporated. The nonlocality length of 0.85 F employed in this analysis leads to an attenuation of the single-particle wave functions by about 15% inside the nucleus. Neutron spectroscopic factors obtained here compare favorably with corresponding results from the study of (d,p) and (t,d) reactions. Author (NSA)

N72-10666# Oak Ridge National Lab., Tenn.
RE-EVALUATION OF NATURAL IRON NEUTRON AND GAMMA-RAY PRODUCTION CROSS-SECTIONS-ENDF/B MATERIAL 1124
S. K. Penny and W. E. Kinney Apr. 1971 73 p refs
(Contract W-7405-eng-26)
(ORNL-4617; ENDF-139) Avail: NTIS

Data and agreement between calculated and experimental cross sections prompted the re-evaluation of natural iron neutron and gamma-ray production cross sections for ENDF/B use with the aim of improving angular distributions and extending inelastic level excitation cross sections. Calculations are described and are shown to be in good agreement with experiment. Below 2 MeV, neutron elastic scattering cross sections and cross sections for inelastic scattering to levels in Fe-56 are obtained. Above 2 MeV, neutron elastic scattering cross sections and cross sections for inelastic scattering to levels in Fe-56 up to an excitation energy of 4.116 MeV are obtained. Cross sections for inelastic scattering to the continuum are examined. Author (NSA)

N72-10667# Los Alamos Scientific Lab., N.Mex.
TWODIM: A COMPUTER CODE FOR UNFOLDING DIAMETRICAL GAMMA-RAY SCANS ON REACTOR FUEL ELEMENTS
B. K. Barnes and J. R. Phillips May 1971 28 p
(Contract W-7405-eng-36)
(LA-4676; DR-1837) Avail: NTIS

A computer code was written to accept one or more diametral scans taken at different angles around the outside of a fuel element and use this information to determine the distribution of the measured isotope over a cross section of the fuel element. The calculated distribution is plotted both as an isometric projection plot and as a density plot. Fission-product distributions calculated with this code were compared to actual distributions measured on thin cross sections of the fuel. Author (NSA)

N72-10668# Oregon State Univ., Corvallis.
NUCLEAR CHEMISTRY Progress Report, 15 Mar. 1970 - 15 Mar. 1971
Walter D. Loveland Mar. 1971 43 p refs
(Contract AT(45-1)-2227)
(RLO-2227-T-7-1) Avail: NTIS

Research on the nuclear fission process emphasized the initial fission fragment angular momentum. Isomer ratios in charged-particle-induced fission was studied, as well as fission fragment prompt gamma ray angular correlations, transition state spectroscopy in Ra-226 fission, and nuclear spectroscopy of Z = 50 and N = 82 nuclides. Additional topics of study were neutron beam extraction and fast radiological separation systems. K.P.D.

N72-10669# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
EVALUATION OF U-238 NEUTRON CROSS SECTIONS FOR THE ENDF/B VERSION 2 FILE
T. A. Pitterle Mar. 1971 74 p refs
(Contract AT(30-1)-4181)
(WARD-4181-1; UC-34) Avail: NTIS

Neutron cross sections of U-238 for material 1103 of the ENDF/B Version 2 data file were evaluated. The evaluation includes capture, fission, total, (n, xn), and elastic and inelastic scattering cross sections. The implications of measurements made since the evaluation are discussed as well as estimated uncertainties in the evaluated data. NSA

N72-10670# Addis Translations International, Woodside, Calif.
MANY-PARTICLE ISOMETRIC NUCLEAR STATES AS SOURCES OF PROTRON AND NEUTRON RADIOACTIVITY
L. K. Peker and E. I. Volmyanskii Mar. 1971 7 p Transl. into ENGLISH from the Russian report Sponsored by AEC Prepared for UCRL
(UCRL-trans-1444) Avail: NTIS

Proton radioactivity of model which is difficult to observe because the region of proton-active nuclei is far from the band of beta stability is discussed. Proton radioactivity is observed more easily in the excited isomeric states of nuclei, which are more nearly beta stable. Of particular advantage are many-particle isomeric states with high spin. Candidates for possible nucleon radioactivity are tabulated in the neutron-deficient and neutron-rich regions. NSA

N72-10671# Oak Ridge National Lab., Tenn.
THE GOOD MIXING CONCEPT IN THE USE OF TRACERS: FLOW RATE AND RATE OF THE CENTER OF GRAVITY OF A TRACER CLOUD IN THE STUDY OF A DISCHARGE (APPENDIX 2)
M. Alquier, G. Courtois, G. Gruat, and G. Sauzay [1971] 13 p refs Transl. into ENGLISH from Houille Blanche (France), v. 25, 1970 p 643-650 Sponsored by AEC
(ORNL-TR-2497) Avail: NTIS

When measuring flow rate with tracers, it is usual to use methods of integration in time, which are based on the well-known good mixing condition: the integral from O to T of C dt = Cte. The relation is general, whatever the method used in deducing it from general definitions relative to concepts of perfect tracers and from representativeness of the outflow by the tracer, using analogies with transitory and permanent regimes. It is a necessary and sufficient condition for measuring flow with tracers regardless of the initial conditions of injection. It is possible to establish a relation between the flow and one or more typical parameters of tracer displacement. Especially in the methods based on the rate of the center of gravity movement of a tracer cloud, there is a relation between this rate and the average rate of fluid flow. The ratio is a function of the profile of the outflow rate studied and usually is different from 1. The calculations utilize probability theory and principles of fluid mechanics. Comments on the concept and use of average time of passage between two given sections are given. Author

N72-10672# Colorado Univ., Boulder. Nuclear Physics Lab.
[EXPERIMENTAL AND THEORETICAL NUCLEAR PHYSICS PROGRAMS] Technical Progress Report
1 Nov. 1970 147 p refs
(COO-535-620) Avail: NTIS

Nuclear research for the period 1 November 70 to 1 November 71 is reported. The studies reported include: (1) multinucleon transfer reactions, (2) reactions on intermediate mass nuclei, (3) comparison of elastic scattering of He-3 and tritons at 20 MeV, (4) He-3 optical model ambiguities at 37.7 MeV, (5) gamma ray experiments, and (6) apparatus and facility development. F.O.S.

N72-10673# Florida Univ., Gainesville.
[NUCLEAR CHEMISTRY RESEARCH ON CHARGED PARTICLE INTERACTIONS WITH MATTER AND THIN FILM DETECTORS] Annual Progress Report, 1970
1970 76 p refs
(ORO-2843-18) Avail: NTIS

Research progress by the nuclear chemistry group at the University of Florida during 1970 is described. The research covered ternary fission, charged-particle interactions with matter, and the use of thin film detectors as dE/dx counters. NSA

N72-10674# Naval Postgraduate School, Monterey, Calif.
MOD-5: A COMPUTER CODE FOR CALCULATIONS OF NEUTRON TIME-ENERGY DISTRIBUTIONS IN THE SLOWING DOWN REGION
Theodore J. Williamson Jun. 1971 112 p refs
(AD-727676; NPS-61WN71061A) Avail: NTIS CSCL 18/11

The document provides users' information for a computer code, MOD-5, which calculates the time and energy dependent evolution of the neutron density in homogeneous media following initiation of a pulsed neutron source of arbitrary energy distribution. The code is based on a discrete stochastic model of the neutron slowing down process developed by the author. Author (GRA)

N72-10675# Naval Postgraduate School, Monterey, Calif.
MEASUREMENT OF THE ELECTRON-DEUTRON INELASTIC SCATTERING CROSS SECTION AT MOMENTUM TRANSFER OF 0.5 FERMI SUPERSCRIPT-2 M.S. Thesis
Lewis Philip Gaby, II Sep. 1971 35 p refs
(AD-727674) Avail: NTIS CSCL 20/8

Measurement of the inelastic electron-deuteron scattering cross section was made at a momentum transfer of 0.5 Fermi superscript(-2) (q squared = 0.5F superscript(-2)) and for the scattering angles of 120 degrees, 135 degrees, and 150 degrees. As a result the transverse and longitudinal parts of the cross section could be separated. The spectrum cross sections measured also showed an indentation or 'dip' which will require further study. Author (GRA)

N72-10676# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
ANALYSIS OF THE ENERGY RESOLUTION OF 90 DEGREE CROSS BEAM EXPERIMENTS
Ronald L. Cowperthwaite and Howard Myers 27 Jan. 1971 27 p refs
(Contract F19628-70-C-0134; AF Proj. 4642)
(AD-725073; AFCRL-71-0269; SR-3) Avail: NTIS CSCL 07/4

The energy response function for two Maxwell-Boltzmann beams intersecting at 90 degree is derived. An unfolding equation is derived for the case when one of the beams is accelerated. It is found that, when the masses of the constituents of the two beams are quite different, interesting special cases arise. In particular, it is shown that in electron impact experiments thermal broadening is negligible. Author (GRA)

N72-10677*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GROWTH KINETICS OF THE S SUB H CENTER ON MAGNESIUM OXIDE USING ELECTRON PARAMAGNETIC RESONANCE
John P. Jayne Washington Nov. 1971 12 p refs
(NASA-TN-D-6561; E-6513) Avail: NTIS CSCL 07D

Electron paramagnetic resonance spectroscopy was used to study the growth of S sub H centers on magnesium oxide powder which had hydrogen adsorbed on its surface. The centers were produced by ultraviolet radiation. The effects of both radiation intensity and hydrogen pressure were also studied. At constant hydrogen pressure and radiation dose, the initial S sub H center growth rate was found to be zero order. Beyond the initial region the growth rate deviated from zero order and finally approached saturation. The results are interpreted in terms of a model which assumes that the S sub H center is a hydrogen atom associated with a surface vacancy. Saturation appears to result from a limited supply of surface vacancies. Author

N72-10678# Harry Diamond Labs., Washington, D.C.
NONRELATIVISTIC ENERGY LOSS OF CHARGED PARTICLES IN ANISOTROPIC MEDIA
Clyde A. Morrison May 1971 23 p
(DA Proj. 1T061102A31C; HDL Proj. 3QE32)
(AD-725473; HDL-TR-1548; AMCMS-501B.11.84500) Avail: NTIS CSCL 20/12

The energy loss of a nonrelativistic charged particle moving through an anisotropic medium is calculated by the method of Landau. The results are presented in terms of a power series in the direction cosines of the path of the particle relative to the direction chosen to describe the dielectric constant. The coefficients in the series expansions are given in terms of integrals involving the various dielectric constants. Author (GRA)

N72-10679# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON A POSSIBLE MECHANISM FOR LOCALIZATION OF FISSION FRAGMENTS FOR A HIGH ALTITUDE THERMONUCLEAR EXPLOSION
V. I. Kozlov and Iv. G. Shafer [1971] 3 p refs Transl. into

ENGLISH from Kosmich. Issled. (USSR), v. 9, no. 4, 1971 p 630-631
Avail: NTIS National Translations Center, John Crerar Library, Chicago, Ill. 60616

A mechanism for explaining the prolonged existence of explosion products at high altitudes in the magnetically conjugate domain to the locale of the explosion is developed. It is based on a magnetogravitational trap, which is a potential well for heavy charged fission fragments. Part of the heavy ions with energies on the order of 30 eV which are cooled in the expanding cloud are trapped, and the spatial distribution of these ions trapped by the potential well takes the form of a funnel. The magnetically conjugate region, which is the base of the funnel, is continuously filled by particles from regions lying above the funnel as ions depart from it into the loss cone. N.E.N.

N72-10680# Northeastern Univ., Boston, Mass. Physics Dept.
HARD PION CURRENT ALGEBRA PREDICTIONS OF A1 MESON DECAYS
P. J. Polito (Springfield Coll., Mass.) and M. T. Vaughn Aug. 1971 21 p refs
(Grant NSF GP-12396)
(NUB-2099) Avail: NTIS CSCL 20H

Standard hard-pion current algebra techniques are extended to obtain predictions of decay widths for various decays of the A1 meson. The decay A1 yields rho meson + pion in which the rho meson is treated as a stable particle, and the decay mode pion + gamma are discussed. The chain A1 yields rho meson + pion yields 3 pions is then considered, and interference effects which appear in the decay are carefully analyzed and computed numerically. Comparison of numerical results for the decay widths of A1 yields rho meson + pion, A1 yields pion + gamma, and A1 yields rho meson + pion yields 3 pions (including the interference effects) is made between the standard hard-pion current algebra models and the current smoothness model. The procedure differs from the standard current algebra approaches in that pole dominance on the vector current propagator is not assumed but some of the continuum contributions to the vector current propagator are included. Author

N72-10681# Department du Synchrotron Saturne, Saclay (France).
CALCULATION OF THE INTERNAL STRUCTURE OF THE INTENSE FLUX OF CHARGED PARTICLES HAVING A NONLAMINAR AXIALLY SYMMETRIC STRUCTURE [CALCUL DE LA STRUCTURE INTERNE DES FLUX INTENSES DE PARTICULES CHARGEES AYANT UNE STRUCTURE NON LAMINAIRE, AXIALEMENT SYMETRIQUE]
V. S. Kuznetsov, V. I. Bogdanova, and O. L. Komarov [1971] 27 p refs Transl. into FRENCH from Russian report In FRENCH
(NP-TR-1933; DSS-TR-R-47; D-0111) Avail: AEC Depository Libraries

A statistical method was used to calculate the nonlaminar beam. A system of equations describing the internal structure of the nonlaminar beam of charged particles is derived. A nonlaminar beam model with non-zero angular velocities is considered and it is shown that this model describes the properties of the actual beams much better than the nonlaminar models with zero angular velocity. The calculated results of the internal structure of an intense nonlaminar beam, focused by homogeneous longitudinal magnetic fields, are given. Author (NSA)

N72-10682# Department du Synchrotron Saturne, Saclay (France).
USE OF HF QUADRUPOLAR FOCUSING IN ION LINEAR ACCELERATORS [UTILISATION D'UNE FOCALISATION HF QUADRUPOLAIRE DANS LES ACCELERATEURS LINEAIRES D'IONS]
V. A. Teplyakov [1971] 19 p refs Transl. into FRENCH from a Russian report In FRENCH
(NP-TR-1934; DSS-TR-R-45) Avail: AEC Depository Libraries

The use of HF quadrupolar focusing in proton linear accelerators is examined theoretically considering the single interval, variants of HF focusing, basic relations, the electrodes, the initial part of the accelerator, and the H cavity. The possible parameters of a proton linear accelerator using HF focusing by a quadrupolar field are tabulated on the basis of theoretical considerations. NSA

N72-10683# California Univ., Berkeley. Lawrence Radiation Lab.
STUDY OF THE REACTIONS KAON(MINUS) PROTON YIELDS SIGMA(PLUS OR MINUS) HYPERON PION (MINUS OR PLUS) (PION(0)) BETWEEN 1.1 AND 1.7 GeYc Ph.D. Thesis
Daniel Frederick Kane, Jr. Apr. 1971 141 p refs
(Contract W-7405-Eng-48)
(UCRL-20682) Avail: NTIS

New data are presented for angular distributions, polarizations, and Legendre coefficients for Sigma(+ or -) hyperon pion(- or +); Dalitz plots and invariant mass-squared plots for Sigma(+ or -) hyperon pion(- or +) pion(0); and cross sections for all reactions. For the two-body final states a partial wave analysis is also presented. A new technique was developed for finding new resonant structure when some resonances are well known, using nonresonant parameterizations in such a way that the appropriate resonances are suggested by the data. Applying this technique to the data, independent evidence is found for several resonances not previously well established. In particular, the presence of resonances in the F15 and D13 waves between 1.9 and 2.0 GeV is confirmed. Also the couplings for resonances associated in representations of the SU(3) group were examined. Author (NSA)

N72-10684# Brookhaven National Lab., Upton, N.Y. Technical Information Div.
PARAMETRIC METHOD FOR CALCULATING THE COULOMB ENERGY OF CERTAIN SHAPES OF FISSIONABLE NUCLEI
G. D. Adeev and P. A. Cherdantsev 1969 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (Tomsk), no. 12, 1969 p 127-129
(BNL-TR-424) Avail: NTIS

A modified nuclear drop model was used for calculating the Coulomb energy of certain fissioning nuclei. Considering that the calculations of the Coulomb energy for an ellipsoid can be reduced simply to the calculation of (1/r), an attempt was made of using the same averaging for strongly deformed nuclei, differing from ellipsoid. Simple formulas were obtained for calculating the Coulomb energy of deformed nuclei on the basis of averaging 1/r inside the volume. The Coulomb energy in units of 3/5(Z2E2/R0) is tabulated. NSA

N72-10685# Brookhaven National Lab., Upton, N.Y. Div. of Technical Information.
ACCELERATION AND EXTRACTION OF DEUTERONS FROM THE JINR PROTON SYNCHROTRON
A. M. Baldin, Yu. D. Beznogikh, L. P. Zinovev, I. B. Issinkii, G. S. Kazanskii, A. I. Mikhailov, V. I. Moroz, N. I. Pavlov, and G. P. Puchkov Jun. 1971 8 p refs Transl. into ENGLISH of Russian report JINR-P9-5442
(BNL-TR-431; JINR-P9-5442) Avail: NTIS

Improvement of the linear accelerator and high frequency systems of the proton synchrotron was completed. This permitted deuteron acceleration at a momentum of 11 GeV/c to be realized. The accelerated deuteron beam was extracted from the synchrotron and physical experiments were started. Author (NSA)

N72-10686# Brookhaven National Lab., Upton, N.Y. Div. of Technical Information.
INFLUENCE ON THE VALENCE-SHELL STRUCTURE ON

THE INTERNAL CONVERSION COEFFICIENTS OF GAMMA-RADIATION AND ON THE ELECTRON DENSITY NEAR THE NUCLEUS

E. M. Anderson, M. A. Listengarten, and M. A. Khanonkind Jun. 1971 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Fiz. (Moscow), v. 34, no. 4, 1971 p 850-855
(BNL-tr-427) Avail: NTIS

The influence of structure changes of the valent shell on internal conversion coefficients was studied using the Sn-119 atom with eliminated 5p-electron. The relation between the variations in valent shell configuration, the internal conversion coefficient on the external shells, and electron density near zero was verified by direct calculations. NSA

N72-10687 Indiana Univ., Bloomington.

SEPARATED ELECTRON PAIR WAVEFUNCTION FOR THE GROUND STATE OF THE HYDROXIDE MOLECULARION Ph.D. Thesis

Jack Dean Allen 1970 104 p
Avail: Univ. Microfilms Order No. 70-17949

Wave functions for the 1 Sigma + ground state of the hydroxide molecular ion are calculated within the self-consistent field and separated electron pair formalisms. The separated electron pair model assumes a many-electron wavefunction which is the antisymmetric product of strongly orthogonal geminals or pair functions. Various probability distributions are examined. The most probable configuration for the bonding electrons is one which places one electron near the oxygen nucleus and one near the hydrogen nucleus. The uncorrelated (SCF) description predicts the most probable configuration to be one in which both of the bonding electrons are near the oxygen nucleus. Some contour maps of the pseudonatural orbitals are given. The relationship between correlation energy and kinetic energy is explored. The principal natural-orbitals are found to differ from the canonical Hartree-Fock orbitals in that the sum of the self-repulsion energies of the former is greater.
Dissert. Abstr.

N72-10688 Pittsburgh Univ., Pa.

DETERMINATION OF THE STATIC AND DYNAMIC ELECTRIC QUADRUPOLE MOMENTS OF THE FIRST 2(PLUS) STATES IN Os188, Os190 AND Os192 BY MEANS OF COULOMB EXCITATION Ph.D. Thesis

Richard Joseph Pryor 1970 82 p
Avail: Univ. Microfilms Order No. 70-19498

The ratio of inelastically scattered ions exciting the first 2(+) state to elastically scattered ions was measured using an Enge split pole spectrograph and position sensitive solid state counters. Measurements were performed at various angles and energies using He-4 and O2 beams from the tandem Van de Graaff. The static electric quadrupole moment q2(+) and the B(E2, O(+) yields 2(+) were determined using the Winther-de Boer Coulomb excitation program and a least squares code. The static electric quadrupole moments of the first 2(+) state of Os-188, Os-190, and Os-192 are determined. The results are in good agreement with predictions from model calculations.
Dissert. Abstr.

N72-10689 Princeton Univ., N.J.

DEUTERON-DEUTERON ELASTIC SCATTERING AT 2.20 GeV/c Ph.D. Thesis

Piermaria Jorge Oddone 1970 143 p
Avail: Univ. Microfilms Order No. 70-19797

The deuteron-deuteron differential cross section was obtained at an incident laboratory momentum of 2.20 GeV/c. The data covers a momentum transfer range from 0.07 (GeV/c) to the kinematic limit at 90 deg CM scattering angle. The data was obtained in a 15 inch rapid cycling bubble chamber in an exposure corresponding approximately to 2.5 events/microbarn. The features of the observed differential cross section were interpreted using the Glauber multiple scattering theory. In applying this theory, it was extended to include the quadrupole deformation of the deuteron which was neglected in previous theoretical studies of deuteron-deuteron collisions. Theoretically it was found that the quadrupole deformation of the deuteron plays a significant role in the region where interference occurs in the multiple scattering amplitudes. The theoretical predictions agree qualitatively with the experimental data. Quantitative agreement was obtained only for momentum transfers below 0.2 (GeV/c)sq. Dissert. Abstr.

N72-10690 California Univ., Los Angeles.

EXCITATION FUNCTIONS OF PROTON-INDUCED REACTIONS ON OXYGEN AT MEDIUM ENERGIES Ph.D. Thesis

Stephen Norbert Bunker 1970 160 p
Avail: Univ. Microfilms Order No. 70-19835

Elastic and inelastic protons scattered from oxygen-16 were observed at laboratory angles between 60 and 160 deg with NaI(Tl) detectors. The incident beam energy was varied in approximately 200 keV steps from 21.25 to 33.12 MeV and in 500 keV steps at higher energies up to 38.50 MeV. Angular distributions at the same energies were also taken for inelastic scattering. The excitation functions for the (p,d) and (p,alpha) reactions were measured at 70 deg for the same energy range, and the (p,t) reaction was observed above 31 MeV. The elastic data were partially integrated over the angular range 100 deg to 160 deg. Several peaks are observed both in the normal excitation functions and in the integrated curves. An optical model with resonance analysis of the data is presented. A coupled-channels calculation was also performed on the elastic and inelastic channels, which assumes coupling to a vibrational state. A fluctuation analysis was also attempted, but the results are inconclusive. Dissert. Abstr.

N72-10691 Vanderbilt Univ., Nashville, Tenn.

PRECISE MEASUREMENTS OF GAMMA-RAY ENERGIES AND INTENSITIES WITH APPLICATION TO THE DECAYS OF Ag-108m, Ag-110m, Zr-95, AND Mo-99 Ph.D. Thesis

Suresh Marutirao Brahmavar 1970 95 p
Avail: Univ. Microfilms Order No. 70-16412

The energies and intensities of gamma rays are measured in the energy range of 400 to 1800 keV with a precision better than 0.1 keV using an iron-free double-focusing spectrometer and germanium lithium-drifted and silicon lithium-drifted detectors. The techniques were applied to decay measurements of even-even and odd-mass nuclei. Measurements of K/L ratios, electron-intensity ratios, and total and K-conversion coefficients are included. The application of precise energy and intensity measurements in the decays of Ag-110m and Ag-108m was demonstrated. Dissert. Abstr.

N72-10692 Purdue Univ., Lafayette, Ind.

MEASUREMENTS OF THE STATIC QUADRUPOLE MOMENT OF THE FIRST EXCITED STATE OF THE NUCLEI Pd-106 AND Pd-110 BY HEAVY ION COULOMB EXCITATION Ph.D. Thesis

Robert William Beyer 1970 226 p
Avail: Univ. Microfilms Order No. 70-18596

The static quadrupole moments of the 511.7 KeV 2+ state in Pd-106 and the 373.8 KeV 2+ state in Pd-110 were determined by employing Coulomb excitation techniques. Thin foils of separated isotope Pd were bombarded with 25 and 30 MeV O-16 ions and 55 and 56 MeV S-32 ions. The angular distributions of the inelastically scattered ions were measured in coincidence with the de-excitation gamma rays to determine the relative excitation probability. The attenuations of the de-excitation gamma ray distributions were measured. The experimental data were fitted using the deBoer-Winther multiple Coulomb excitation program. Self-consistency of the oxygen and sulfur data suggests that excitation via the giant dipole resonance must be small compared to the reorientation effect and that the excitation via the second 2+ states at 814 KeV in Pd-110 and 1127 KeV in Pd-106 interferes constructively so as to increase the excitation probability. Dissert. Abstr.

N72-10693 Pennsylvania State Univ., University Park.
HIGH RESOLUTION RAMAN SPECTROSCOPY OF GASES Ph.D. Thesis
Daryl Louis Renschler 1969 57 p
Avail: Univ. Microfilms Order No. 70-19454

A Raman spectroscopic system was built which featured a large coarse echelle grating doubly passed as the dispersing element. The 6328 A radiation inside the cavity of a He-Ne laser was used to excite the Raman spectra. The spectrometer had sufficient sensitivity and rejection of spurious light to allow Raman shifts as small as a fraction of a wavenumber to be observed. This system provided photoelectrically detected spectra with resolution and wavelength calibration accuracy at least as good as that previously obtained photographically. The rotational Raman spectrum of oxygen was recorded in which the fine structure due to the (3 Sigma g -) ground state was observed. The complete R and S-branch rotational spectra of nitric oxide and ethane were recorded and their theoretical analyses given. Calibration measurements on the ethane spectrum yielded an accuracy possibly surpassing photographically recorded spectrum. Dissert. Abstr.

N72-10694 California Univ., Berkeley.
A MEASUREMENT OF THE BRANCHING RATIO KAON(0) SUB L YIELDS 2 PION(0)/KAON(0) SUB L YIELDS 3 PION(0) Ph.D. Thesis
William Parker Oliver 1969 62 p
Avail: Univ. Microfilms Order No. 70-17632

The rate of the decay kaon(0) sub L yields 2 pion(0) was measured relative to that of kaon (0) sub L yields 3 pion(0) using a monoenergetic kaon(0) sub L beam and a nearly 4 pion solid-angle detection system of lead-plate spark chambers and shower counters. The analysis of the fraction (40%) of the data gives the branching ratio of 0.0100 + or - 0.0018 (statistical) + or - 0.0009 (systematic). Dissert Abstr.

N72-10695 California Univ., San Diego.
SURFACE RESPONSE PROPERTIES OF A BOUNDED ELECTRON GAS Ph.D. Thesis
Joseph Alan Rudnick 1970 182 p
Avail: Univ. Microfilms Order No. 70-17281

Surface response properties at a bounded electron gas are studied on a microscopic and macroscopic basis. The macroscopic discussion is based on the assumption that the response of the gas to a perturbing potential field can be characterized by a lokal, frequency-dependent dielectric constant. The microscopic study of surface response was based on a model in which the electron gas is assumed to be confined to a half space by an infinite potential barrier. It was shown that the interaction between an electron well outside a bounded electron gas and the gas can be described in terms of the dielectric response of the electron gas. An analytic form for the static response kernel of a non-interacting half-space electron gas and a self-consistent Hartree hypothesis was the basis of a study of the screening charge density associated with an impurity charge density inside and near the surface of a half space electron gas. Dissert. Abstr.

N72-10696 New York Univ., N.Y.
CORRELATION BETWEEN LUMINESCENCE, PHOTOCONDUCTIVITY AND EPR SIGNALS IN Zn PHOSPHORS Ph.D. Thesis
Abraham Norman Silverman 1969 84 p
Avail: Univ. Microfilms Order No. 70-19041

The X-ray and thermal induced changes in the capacitance and dissipation factor of samples composed of a thin layer of ZnS powder were measured using the ac capacitance bridge method. An examination and comparison of these measurements with the fluorescent efficiencies lead to the conclusion that, for these materials, the ac response cannot solely be attributed to the existence of a conductivity defined in the usual manner. The effects of trapped electrons that evaporate and follow the ac field are discussed for a Cr doped ZnS phosphor. Dissert. Abstr.

N72-10697 Rensselaer Polytechnic Inst., Troy, N.Y.
AN INVESTIGATION OF ION INDUCED ELECTRON EMISSION FROM METALLIC OXIDES Ph.D. Thesis
John D. Stein 1970 123 p
Avail: Univ. Microfilms Order No. 70-19956

Secondary electron yields produced by ion impact on aluminum oxide, titanium oxide, and beryllium oxide were measured. Results are reported for alkali metal and alkaline earth ions (Ba, Sr, Li, Cs) having energies ranging from 10 to 40 KeV. The mean electron yield varied between 2 and 9, as a function of ion energy and ion-target combination. A mass spectrometer was also developed in order to determine the mass and energy of the primary ion beam completely. The instrument consists of a large homogeneous electromagnet containing multiple ion trajectories. The method used for secondary electron measurement yields results that are less subject to error than classical measurements, due to the fact that the detector is insensitive to negative ions. In addition, the method allows measurement of electron yields of semiconducting and insulating materials, where low primary ion currents are desirable to prevent charge buildup or contamination. Dissert. Abstr.

N72-10698 North Carolina State Univ., Raleigh.
NUCLEAR MAGNETIC RESONANCE LINESHAPE STUDIES OF DIPOLAR BROADENED SPIN SYSTEMS Ph.D. Thesis
Raymond Earl Fornes 1970 119 p
Avail: Univ. Microfilms Order No. 70-18967

A new theoretical approximation is presented to describe the free induction decay in dipolar broadened spin systems on a rigid lattice. This new theory is based on a combination of earlier theories of Evans and Powles as generalized by Demco and of Lowe and Norberg as extended by Lee, Tse, Goldberg, and Lowe (LTGL). The LTGL result is generalized, as Demco's, to include an arbitrary number of spin sets, each of arbitrary spin. The experimental broadline analysis of the fluorine resonance in SrF2 was made on a Varian DA-60E spectrometer and a detailed investigation of the continuous wave absorption lineshape was carried out. It was found that the new theory presented is, in general, the best when compared with experiment of all the existing theories based on the auto-correlation function. It was also found that experimental continuous wave results can be compared in detail with experimental free induction decay results. Dissert. Abstr.

N72-10699 New York Univ., N.Y.
ONE-SPEED NEUTRON TRANSPORT WITH ANISOTROPIC SCATTERING BY THE TRANSFER MATRIX METHOD Ph.D. Thesis
Gerhard Albert Caroll 1969 284 p
Avail: Univ. Microfilms Order No. 70-19279

The transfer matrix method is applied to the solution of several one-speed neutron transport problems in slab geometry. The problem of reflection and transmission by a slab, the Milne problem, and the critical problem with symmetric reflectors are considered. The solutions are written in terms of integral operators which are derived explicitly as functions of the slab cross sections and thickness. The scattering cross section is expressed as a series of Legendre polynomials of arbitrary order. Treatment of nonabsorbing and multiplying media is given in detail. Highly accurate numerical solutions for the three problems are obtained by expanding the angular distribution in a series of double Legendre polynomials. A procedure is presented which yields accurate values of the scattered distribution when neutrons are monodirectionally incident on a slab. The calculational advantages of the transfer matrix method are demonstrated and explicit comparisons of computing times with invariant imbedding and doubling techniques are given. Dissert. Abstr.

N72-10700 Rensselaer Polytechnic Inst., Troy, N.Y.
MOBILITY OF A FAST POLARON Ph.D. Thesis
Paul Otto Massicot, Jr. 1970 141 p
Avail: Univ. Microfilms Order No. 70-19944

The mobility of an electron interacting with sound vibrations and traveling at a velocity in the range of the phase velocities of the acoustic modes is calculated. Photon coordinates are eliminated using path-integral techniques of Feynman, Hellwarth, Iddings, and Platzman. An expansion about the classical path leads to a closed-form evaluation of the mobility and of the mean-square deviation. One concludes tentatively that the wave-mechanical mobility will be just that obtained from classical mechanics, and that in the critical region of velocities one may conveniently think of the electron as undergoing uniform motion against a steady frictional opposition. Some quantitative comparison with experiment is given. Author (NSA)

N72-10701 Ohio State Univ., Columbus.
QUADRUPOLE SPLITTING OF AI 27 NUCLEAR MAGNETIC RESONANCE IN TOPAZ Ph.D. Thesis
Jesse Beadles Lumsden 1970 71 p
Avail: Univ. Microfilms Order No. 70-19336

The asymmetry parameter and the quadrupole coupling constant were determined for the splitting phenomena in topaz. The results show the coupling constant to be 1.69 + or - .03 mHz and the asymmetry parameter to be .469 + or - .009. The direction cosines of the principle axes of one of the four nonequivalent sites was also determined and results are given in tabular form. Direction cosines for other sites may be determined by reflecting the crystal axes. Dissert. Abstr.

N72-10702 Washington Univ., Seattle.
A GENERALIZATION OF THE NODAL APPROXIMATIONS TO THE LINEAR BOLTZMANN EQUATION APPLIED TO PROBLEMS IN NEUTRON TRANSPORT THEORY Ph.D. Thesis
Dennis Gabriel Stenstrom 1970 188 p
Avail: Univ. Microfilms Order No. 70-19660

A generalized approximation to the transport equation is developed and the procedure for its extension to energy-dependent multidimensional problems is outlined. This procedure adds another degree of freedom to the approximation and more flexibility in its application. The number of angular nodes is reduced while still retaining the same accuracy. Numerical evaluation of the approximation is performed on model problems in monoenergetic neutron transport in plane geometry. The number of angular nodes required for a given accuracy can be reduced by a factor of 1/2 to 1/4 by using reasonable trial solutions, and improved results will be obtained whenever trial solutions are used which are a better approximation than is an isotropic distribution. Dissert. Abstr.

N72-10703 California Univ., Berkeley.
THE EFFECT OF CRYSTALLINITY AND INTEGRATED FLUX ON THE RANGE OF CESIUM IONS INJECTED AT 20 keV INTO ALUMINUM Ph.D. Thesis
Wigbert Josef Siekhaus 1969 129 p
Avail: Univ. Microfilms Order No. 70-17656

The concentration profile of ions injected into a metal target was investigated both theoretically and experimentally as a function of the integrated flux of the bombarding ions. A theoretical solution for the time-dependent concentration is given. It is proven that the number of bombarding ions contained in a target at saturation is increased if the ions diffuse throughtout the target. Polycrystalline and monocrystalline aluminum were bombarded with radioactive cesium for increasing values of integrated flux. The total number of cesium atoms contained in the target after bombardment and the number contained after removal of successive layers were measured by counting the beta radiation emitted by cesium. Mean depth of the concentration decreases with increasing integrated flux. These measurements suggest that diffusion in the range of penetration is an important factor in determining the shape of the concentration. Saturated aluminum is a much more effective stopping material, assuming a random lattice, than theoretical arguments would predict. Dissert. Abstr.

N72-10704 Colorado State Univ., Fort Collins.
RAMAN SCATTERING IN ALPHA-QUARTZ Ph.D. Thesis
Jon Dickinson Masso 1970 135 p
Avail: Univ. Microfilms Order No. 70-20017

The intensity, position, and width of each Raman line was measured as a function of the polarization of both the incident and scattered light and as a function of the angle between the phonon propagation direction and the optic axis. A laser source was used, and all the lines were measured under the same experimental conditions with a totally digital spectrometer using photon counting techniques. The relative magnitudes of the elements of the Raman tensors were evaluated from the intensity data. The frequency shifts of the lines as a function of orientation agree with theoretical predictions. The lineshape function was determined and an accurate value for the width of each line was found. The electro-optic contribution to the Raman scattering in general detracts from the scattering rather than enhances it. A method for removing instrument function effects is given which combines a deconvolution procedure with standard nonlinear least squares fit techniques. Dissert. Abstr.

N72-10705 University of Southern Calif., Los Angeles.
EXPERIMENTAL STUDY OF THE FARADAY ROTATION OF THE Co2 (PLUS) ION IN TETRAHEDRAL AND OCTAHEDRAL SITES Ph.D. Thesis
Won Keng Ng 1970 171 p
Avail: Univ. Microfilms Order No. 70-19118

The Faraday rotation and optical absorption of the divalent cobalt ions in tetrahedral sites in Cs3CoX5 and Cs3Zn(1-x)Co(x)X5, where X = Cl or Brand $0<x<0.02$, were measured at low temperatures and high magnetic fields. The results are interpreted in terms of crystal field theory. Similar but less complete investigations were carried out on a MgO single crystal containing a small amount of Co(2+) ions in octahedral sites. Dissert. Abstr.

N72-10706 California Univ., Berkeley.
ANALYSIS OF PION HELIUM SCATTERING FOR THE PION CHARGE FORM FACTOR Ph.D. Thesis
Charles Thomas Mottershead 1969 80 p
Avail: Univ. Microfilms Order No. 70-17624

Elastic scattering of positive pion and negative pion on He-4 is analysed for information on the charge radius of the pion using a new method based on boundary conditions near the nuclear surface. The pion radius enters the calculation via the electrostatic potential of the pion and Helium charge distributions, which is assumed to be the only charge dependent interaction. Since He-4 is isoscalar the strong nuclear interaction is assumed charge independent. Differential cross section data for both signs of the charge are fit simultaneously by a program that used the logarithmic derivatives of the pion radial wave function for each charge as free parameters. Nuclear model dependence is greatly reduced by the constraints imposed by the empirical boundary conditions on the internal wave function. The Crowe Group's data at beam momenta of 130 to 163 MeV/c are analysed by this method using both local potential and Kisslinger models for the strong interaction, and Gaussian and Yukawa pion charge distributions. Dissert. Abstr.

N72-10707 Rensselaer Polytechnic Inst., Troy, N.Y.
CALCULATIONS OF NEUTRON-DEUTERON SCATTERING Ph.D. Thesis
Luciano B. Laroze 1970 186 p
Avail: Univ. Microfilms Order No. 70-19942

Scattering equations of the Lovelace type appropriate to this case were obtained to determine the elastic scattering amplitudes for a wide energy range up to 100 MeV. Different form factor shapes were used to investigate the sensitivity of the results of the two-nucleon potential. The percent D-state of the dueteron was also varied. The n-d doublet scattering length and its relation with the triton binding energy were studied using a variety of potential shapes. Motivated by the inability to simultaneously fit the triton binding energy and the doublet scattering length, the effects of including a three-nucleon potential in the phenomenological separable form were investigated. By adjusting the parameters in this interaction it was possible to fit both experimental quantities. Dissert. Abstr.

N72-10708 Washington Univ., Seattle.
A NONPERTURBATIVE STUDY OF THE ISOBARIC MULTIPLET MASS EQUATION Ph.D. Thesis
Curtis Elmo Lacy 1970 167 p
Avail: Univ. Microfilms Order No. 70-19635

Two complementary models are developed for the isobaric multiplet mass equation (IMME), in both of which the Coulomb interaction is included exactly. The first is a simple one-particle model which uses a realistic average central nuclear potential, but does not include antisymmetrization effects or residual interaction between valence nucleons. The simplicity of the model allows a study of many nuclei to look for those general features of the IMME which are not dependent on details of nuclear structure, such as shell closure effects. The second model consists of a closed, inert core plus valence nucleons interacting with each other via two-body potentials. The valence-nucleon wave function is fully antisymmetrized. This model allows study of the effect of those features which were ignored in the simple model, but at the cost of introducing the unrealistic harmonic oscillator potential. It is shown that, in second-order perturbation theory, only the valence nucleons contribute to deviations from the quadratic first-order IMME. Dissert. Abstr.

N72-10709 California Univ., San Diego.
CAUSALITY AND LORENTZ INVARIANCE IN RELATIVISTIC QUANTUM MECHANICS Ph.D. Thesis
Yoshiko Ishikawa 1970 78 p
Avail: Univ. Microfilms Order No. 70-17790

It is found that an interaction Hamiltonian density in the physical Fock space, made of a sum of terms, each of which has finite number of creation and annihilation operators, cannot satisfy both Lorentz invariance and causality simultaneously. An interaction Hamiltonian without a causal and invariant density is constructed which gives a Lorentz invariant S-matrix. The detail using the S-matrix given by the model of scalar field theory is also investigated. It is concluded that the properties of S-matrix (Lorentz invariance, analyticity, etc.) do not necessarily require causality and Lorentz invariance of an interaction Hamiltonian density. Dissert. Abstr.

N72-10710 Indiana Univ., Bloomington.
THE STRUCTURE OF Tm-169 AND Tm-171 NUCLEI AND CORRECTIONS TO THE UNIFIED MODEL Ph.D. Thesis
Hsiao-hua Hsu 1970 77 p
Avail: Univ. Microfilms Order No. 70-17956

The structure of the nuclei Tm-169 and Tm-171 was studied in terms of the unified nuclear model of Bohr, Mottelson, and Nilsson. The structure of the ground state rotational bands of the two nuclei resemble each other in general, but differ in detail. The data suggest that the interaction of the unpaired proton with these two added neutrons must play an important role in the structure of Tm-171. A delta function type proton-neutron interaction was introduced into the Nilsson model Hamiltonian as a first perturbation term. The new Nilsson wave functions and single-particle energies were calculated, and the decoupling constant and magnetic parameters b sub o and g sub k were derived. The results of the calculation agree well with the experimental results. Dissert. Abstr.

N72-10711 Rochester Univ., N.Y.
THE ESTABLISHMENT OF UPPER LIMITS FOR TWO PARITY-VIOLATING PARAMETERS IN THE NUCLEON-NUCLEON SCATTERING MATRIX AT 210 MeV Ph.D. Thesis
Edward Joseph Gucker 1970 164 p
Avail: Univ. Microfilms Order No. 70-17883

The experiment constituted a test of parity conservation in the strong nucleon-nucleon interaction in that it placed upper limits on the magnitudes of two parameters which are directly related to the mixing of scattering states of opposite parity. A 210 MeV longitudinally polarized proton beam was allowed to strike targets of polyethylene and of carbon, with the scattered protons being detected by two triple coincidence counter telescopes located on either side of the beam line. The asymmetry a sub k was measured between the counting rates generated by the forward polarized beam and the backward polarized beam. Use of a solenoid to reverse the polarization and frequent interchanging of the counter positions permitted cancellation of most first order systematic errors. The asymmetry for proton-proton scattering was obtained by subtracting a fraction of the carbon asymmetry from the polyethylene asymmetry. Upper limits were established for the two parameters by a chi-square fit to the measured asymmetries. Dissert. Abstr.

N72-10712 Rochester Univ., N.Y.
MEASUREMENTS OF STATIC ELECTRIC QUADRUPOLE MOMENTS AND TRANSITION PROBABILITIES IN THE REGION OF A EQUALS 144 TO 150 Ph.D. Thesis
Henry Steven Gertzman 1970 255 p
Avail: Univ. Microfilms Order No. 70-17881

The Coulomb excitation reorientation effect was used to measure the static electric quadrupole moments of the first 2(+) states in Sm-148, Nd-144, Nd-146, Nd-148, and Nd-150. Results were also obtained for the B(E2, O(+)-2(+)) of Sm-148. Oxygen ions of 34, 38 and 50 MeV and alpha particles of 10, 11 and 13 MeV were scattered from a thin target of Sm-148 and detected by a position sensitive detector in the focal plane of a split-pole spectrograph. A comparison was made of the ratio of the number of elastically and inelastically scattered ions to calculations performed by the coupled channels computer code of Winther and de Boer. Two results were obtained corresponding to the two possible signs of the interference term to the second 2(+) state. Dissert. Abstr.

N72-10713 Arizona Univ., Tucson.
PROPERTIES OF P-29, S-33, AND CL-33 NUCLEI FROM DOPPLER-SHIFT ATTENUATION AND ANGULAR CORRELATION MEASUREMENTS Ph.D. Thesis
John Ernest Cummings 1970 116 p
Avail: Univ. Microfilms Order No. 70-17783

The particle-gamma ray coincidence version of the Doppler shift attenuation method has been employed to obtain information on the mean lives of low-lying states in P-29, S-33, and Cl-33. In addition, the particle-gamma ray method for angular correlation measurements was used to obtain multipole mixing ratios for the 1.97- yields 0.0 MeV and the 2.31- yields 0.84 MeV transitions in S-33. The mean life measurements in P-29 and Cl-33, and the angular correlation measurements in S-33 required the development and use of techniques for the determination of neutron-gamma ray time coincidences. The efforts directed to this problem and the results of the methods used for the neutron-gamma ray coincidence measurements are described. The reduced matrix elements for the electromagnetic transitions among some of the low-lying states in P-29 and S-33 were obtained. Dissert. Abstr.

N72-10714 Purdue Univ., Lafayette, Ind.
CALCULATION OF PERPENDICULAR INFRARED BAND CONTOURS: APPLICATION TO THE nu(4) BAND OF NF3, 1. HARMONIC FREQUENCIES AND FORCE CONSTANTS OF Fe(CO)5, 2. A STUDY OF ACCIDENTAL CORIOLIS RESONANCE IN SYMMETRIC TOP MOLECULES, 3 Ph.D. Thesis
Robert Samuel Weiner 1970 264 p
Avail: Univ. Microfilms Order No. 70-18769

A computer program was written which calculates perpendicular infrared band contours by calculating the positions and intensities of the individual vibration-rotation lines through second order. The program was also used for the calculation of the nu sub 4 band of NF3 which was compared to the experimentally obtained nu sub 4 band. Overtone and combination spectra of the C-O stretching modes of Fe(CO)5 in dilute solution were recorded and were used to correct the C-O stretching frequencies for the effects of anharmonicity. The harmonic frequencies were thus obtained and were used to recalculate the C-O stretch force constants and interaction constants. Accidental Coriolis resonance was investigated for a hypothetical symmetric top molecule. Energy states were calculated for varying degrees of resonance by an exact and by approximate methods. Dissert. Abstr.

N72-10902# Imperial Coll. of Science and Technology, London (England).
EXPERIMENTAL STUDIES OF ATOMIC SPECTRA AND TRANSITION PROBABILITIES
W. R. S. Garton *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 3-19 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

N72-10904# Virginia Univ., Charlottesville.
MANY-BODY CALCULATIONS OF ENERGIES AND TRANSITION PROBABILITIES
Hugh P. Kelly *In* Joint Inst. For Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 37-46 refs (See N72-10901 01-30)
(Contract F33615-69-C-1048)
Avail: SOD $1.75 Order No. C13.10:353

N72-10905*# Harvard Coll. Observatory, Cambridge, Mass.
RADIOACTIVE TRANSITIONS IN THE HELIUM ISOELECTRONIC SEQUENCE
Alexander Dalgarno *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 47-57 refs Sponsored in part by NASA and NSF (See N72-10901 01-30)
(NASA-CR-122846) Avail: NTIS; SOD $1.75 Order No. C13.10:353 CSCL 20H

N72-10867*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M404: PROTON ELECTRON SPECTROMETER
James R. Marbach *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 125-139 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 18H

N72-10868*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M408: BETA SPECTROMETER
James J. Marbach *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 141-152 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

N72-10870*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M409: BREMSSTRAHLUNG SPECTROMETER
Reed S. Lindsey, Jr. *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 169-184 ref (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

N72-10871*# Electro-Optical Systems, Inc., Pasadena, Calif.
EXPERIMENT S026: ION WAKE MEASUREMENT
David B. Medved and Ballard E. Troy, Jr. (NASA. Goddard Space Flight Center) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 185-198 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

N72-10874*# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EXPERIMENT D008: RADIATION IN THE SPACECRAFT
M. F. Schneider, J. F. Janni, and G. E. Radke *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 227-272 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06R

N72-10875*# Air Force Cambridge Research Labs., Bedford, Mass.
EXPERIMENTS D004 AND D007: CELESTIAL RADIOMETRY AND SPACE OBJECT RADIOMETRY
J. Lovett *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 273-302 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 18H

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N72-10715# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Laboratorio Gas Ionizzati.
STRUCTURE OF THE DENSE PLASMA FOCUS. PART 2: NEUTRON MEASUREMENTS AND PHENOMENOLOGICAL DESCRIPTION
Ch. Maisonnier, C. Gourlan, G. Luzzi, L. Papagno (Rome Univ.), F. Pecorella, J. P. Rager, B. V. Robouch, and M. Samuelli 17 Jun. 1971 10 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun 1971
(CN-28/D-2; Conf-710607-37) Avail: AEC Depository Libraries

Neutron measurements carried out on the dense plasma focus (DPF) facility are described. These measurements are done using nuclear emulsions, activation counters, and scintillators coupled to photomultipliers. The neutron flux anisotropies are measured with a precision better than 2%, and reported energy spectra correspond to neutrons emitted in a single discharge. The results obtained lead to the exclusion of the applicability of simple models in interpreting the DPF, but are consistent with a proposed phenomenological model consisting of a combination of a moving boiler with a beam-target. The experimental results relative to X-ray, optical, and neutron measurements, as well as to the preliminary results of numerical computations, are discussed, and the evaluation of certain plasma parameters is given. Author (NSA)

N72-10716# United Kingdom Atomic Energy Authority, Culham (England).
MEASUREMENTS OF THE PLASMA CONFINEMENT AND ION ENERGY IN THE DENSE PLASMA FOCUS
N. J. Peacock, M. G. Hobby (Leicester Univ., England), and P. D. Morgan (Royal Holloway Coll., London, England) 17 Jun. 1971 14 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(CN-28/D-3; Conf-710607-38) Avail: AEC Depository Libraries

The structure and velocity of the plasma boundary during the implosion phase of the dense plasma focus was studied, using repetitively pulsed, l nsec exposure, transmission photography with spatial resolution of 100 microns. Both acceleration and deceleration of the plasma boundary were observed by shadowgram and schlieren photography. Long wavelength, Rayleigh-Taylor instabilities grew on the boundary during its acceleration. On subsequent deceleration, a singularly steep density gradient was observed transiently on the axis of symmetry, having dimensions smaller than any other plasma parameter except for collision-free depth. The density distribution, approximately parabolic with a maximum on the axis of symmetry when the pinch is well developed, was derived directly from interferograms. The ion energy distributions, transverse to the axis of symmetry, of several ion species of argon and neon were measured using high resolution, X-ray spectroscopic techniques. Dielectronic recombination is responsible for the Li-like ion satellites and has to be taken into account in the explanation of the intensity and time of appearance of line emission. Author (NSA)

N72-10717# Institut fur Plasmaphysik G.m.b.H., Garching (West Germany).

INVESTIGATION OF THE MINIMA IN THE PARTICLE CONFINEMENT TIME IN THE WENDELSTEIN 2a STELLARATOR

G. Grieger, W. Ohlendorf, H. D. Pacher, H. Wobig, and G. H. Wolf 17 Jun. 1971 9 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(CN-28/H-3; Conf-710607-103) Avail: AEC Depository Libraries

In particular, measurements of the dependencies of the peak density on the input flux, magnetic field strength, and neutral pressure were carried out at various iota to test theoretically predicted relations. Low-frequency oscillation was observed, and the influence of shear on the position of the minima was investigated. The conclusion is drawn that the most probable explanation for the observed minima is an unstable transition between the classical diffusion and stationary or nonstationary convection. Author (NSA)

N72-10718# Akademiya Nauk URSR, Kharkov. Fizko-Tekhnicheskii Inst.

EXPERIMENTAL RESEARCH ON MAGNETIC SURFACES AND PLASMA CONFINEMENT IN THE SATURN-1 THREE-TURN STELLARATOR-TORSATRON

V. S. Voitsenya, A. V. Georievskii, V. E. Eiser, D. P. Pogozhev, S. I. Solodovchenko, V. A. Suprunenko, V. T. Tolok, I. P. Fomin, and L. A. Dushin 17 Jun. 1971 33 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/H-10; Conf-710607-110) Avail: NTIS

The Saturn-1 toroidal trap is designed for the investigation of the properties of a magnetic field of various configurations and their effect on the plasma confinement. The design of the device allows the creation of two types of magnetic configuration: a three-turn stellarator and a three-turn torsatron configuration. The parameters of the trapped plasma were measured approximately 0.5 ms after the triggering of the sources. The dependence of the plasma confinement time on the value of the longitudinal field and on the field ratio in both stellarator and torsatron regimes was investigated. Investigations of the radial density distribution with the help of twin electric probes showed that the plasma boundary approximately coincides with the outermost undestroyed surface. The quoted confinement time increases with the increase in the helical harmonic of the magnetic field in both torsatron and stellarator regimes. Author (NSA)

N72-10719# Academy of Sciences (USSR), Leningrad.

RESEARCH ON THE TRANSFORMATION AND ABSORPTION OF HIGH FREQUENCY WAVES IN A PLASMA, FOR THE PURPOSE OF DEVELOPING METHODS OF PLASMA HEATING

V. I. Arkhipenko, A. B. Berezin, V. N. Budnikov, V. E. Golant, K. W. Novik, A. A. Obukhov, A. D. Piliya, V. I. Fedorov, and K. G. Shakhovetj 17 Jun. 1971 33 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(CN-28/L-4; Conf-710607-140) Avail: AEC Depository Libraries

The transformation of high-frequency waves introduced into rapidly attenuating longitudinal plasma waves was studied. It was shown that, when account is taken of the inhomogeneity, the transformation must take place in the vicinity of singular points of the concentration constant curves. The characteristics of the transformation in a toroidal magnetic field with shear were investigated. Experiments on the determination of the conditions of wave transformation and absorption were carried out in a homogeneous magnetic field. For the determination of the transformation region, a method of local perturbation (lengthwise) was applied. A weak perturbation of the magnetic field in the region of the transformation led to a sharp reduction in absorption. The study of this effect, together with measurements of the concentration distribution, permitted a comparison of data on the transformation conditions with non-one-dimensional theory. Author (NSA)

N72-10720# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nuclearies.

A STUDY OF GUIDED ELECTRO-MAGNETIC WAVES PROPAGATING THROUGH A VACUUM CHANNEL IN A PLASMA

H. M. Rizk Jan. 1971 18 p refs In FRENCH

(EUR-CEA-FC-577; DPH-PFC/STGI) Avail: AEC Depository Libraries

Nonaxially symmetric guided electromagnetic waves propagating along a cylindrical vacuum channel in an unbounded magnetoactive cold uniform plasma are investigated. The equations of the electromagnetic field and the rate of damping of the surface waves are derived. Several specific cases are considered: (1) an anisotropic plasma in finite, infinite, or very strong magnetic fields, (2) an isotropic plasma, and (3) the quasi-static approximation. Author (NSA)

N72-10721# Academy of Sciences (USSR), Moscow.

STATIONARY TOKAMAK

B. B. Kadomtsev and V. D. Shafranov 17 Jun. 1971 14 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(Conf-710607-81; CN-28/F-10) Avail: AEC Depository Libraries

The possibilities of noninductive maintenance of a longitudinal current, which would in principle make it possible to construct a stationary thermonuclear reactor on the basis of the Tokamak system, are discussed. To maintain a longitudinal current it is necessary to move the field lines of the poloidal magnetic field out towards the periphery of the plasma column. The possibility of doing this is easily demonstrated in principle by taking, as an example, a cylindrical plasma column without longitudinal magnetic field and inducing artificially a flow of matter and energy along the radius. However, it is impossible to induce such a flow in a straight system when there is a strong longitudinal magnetic field. In a toroidal plasma column it is possible to establish a process whereby the current is maintained by the plasma flow. The conditions under which this is possible and the mechanisms involved in maintaining a stationary current in a plasma by means of external electromotive forces are discussed. Author (NSA)

N72-10722# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

THE EQUILIBRIUM, STABILITY, AND DIFFUSION OF A TOROIDAL PLASMA OF NONCIRCULAR CROSS SECTION [EQUILIBRE, STABILITE, ET DIFFUSION D'UN PLASMA TORIQUE A SECTION TRANSVERSALE NON CIRCULAIRE]

G. Laval, H. Luc, E. K. Maschke, C. Mercier, and R. Pellat 17 Jun. 1971 12 p refs In FRENCH; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(Conf-710607-83; CN-28/F-12) Avail: AEC Depository Libraries

The equilibrium and magnetohydrodynamic stability of a Tokamak configuration of noncircular cross section were studied to determine whether the theoretical limiting values of beta and of the current density could be raised by suitably choosing the cross section form. Cases of equilibrium were considered in which the form given to the plasma cross section was elliptical or triangular. A limit for the existence of equilibrium appeared for a beta* (= beta poloidal) value for which the poloidal magnetic field was zero at the edge of the plasma. For values of beta* approaching the equilibrium limit, the localized criterion indicates that any degree of ellipticity is unfavorable. If even slight triangular deformation is superimposed on the elliptical section, the limits set by the localized criterion are completely changed in the neighborhood of the magnetic axis. The plasma then remains stable for stronger current densities and for higher values of beta than in the case of a circular cross section. Author (NSA)

N72-10723# Akademiya Nauk URSR, Kharkov. Fiziko-Tekhnicheskii Inst.

INVESTIGATIONS OF THE ELECTRICAL CONDUCTIVITY AND CURRENT HEATING OF PLASMA IN A STRONG STELLARATOR MAGNETIC FIELD

P. Ya. Burchenko, E. D. Volkov, V. A. Rudakov, V. L. Sizonenko, and K. N. Stepanov 17 Jun. 1971 16 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys., and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-109; CN-28/H-9) Avail: AEC Depository Libraries

The results are given of a study, with electric fields for E = (0.01 to 100) E sub k, of the electrical conductivity of a plasma in a strong magnetic field H sub 0 greater than (4 pi m sub e c sq n sub e)sub 1/2. Here E sub k = 1.36 x 10 to the minus 12th power, (N sub e/T sub e) is the Dreicer critical field, n sub e the plasma density, m sub e the electron mass, T sub e the electron temperature of the plasma, and c the speed of light. It is shown that when the electric field E = (0.1 to 0.7) v/cm and the plasma density n sub e = (2 to 4) x 10 to the 12th power cu cm, the electrical conductivity of the plasma sigma is inversely proportional to E. A comparison is made with data obtained during previous experiments carried out in a narrower range of (E/e sub k) in various closed magnetic traps. An explanation is offered for the data obtained on the basis of assumptions regarding the buildup of ion-acoustic oscillations occurs when the movement of resonance electrons in the field of these oscillations becomes strongly nonlinear, namely when their oscillation velocity attains the order of the wave phase velocity. Author (NSA)

N72-10724# Akademiya Nauk URSR, Kharkov. Fiziko-Tekhnicheskii Inst.

NONLINEAR THEORY OF THE INTERACTION OF RELATIVISTIC AND NONRELATIVISTIC BEAMS WITH A PLASMA. NONLINEAR THEORY OF WAVE TRANSFORMATION

N. S. Erokhin, V. I. Kurilko, M. B. Levin, M. G. Lyubarskii, N. G. Matsiborko, S. S. Moiseev, I. N. Nishchenko, A. P. Tolstoluzhskii, Ya. B. Fainberg, V. D. Shapiro et al 17 Jun. 1971 39 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-61; CN-28/E-13) Avail: AEC Depository Libraries

The excitation of a monochromatic plasma by an electron beam is considered. The maximum field amplitude induced by the beam was found. The capture of beam particles in the potential well created by the wave leads to oscillations in its amplitude with time. A computer investigation of two signals of finite amplitude in the plasma beam system was undertaken. The possibility exists for control of beam instability by means of prior modulation of the beam. Attention is devoted to nonlinear stationary waves in relativistic electron beams of the E-layer type. Attenuation of the Coulomb repulsion forces due to the rotational motion of the electrons results in an increase in the field amplitude. Nonlinear solutions of the isolated wave type were found. A nonlinear theory was developed for Cerenkov excitation of regular oscillations by a pulsed relativistic monoenergetic beam. The question of the transformation of stationary nonlinear waves in the plasma is discussed. Author (NSA)

N72-10725# Akademiya Nauk SSSR, Novosibirsk. Inst. Yadernoi Fiziki.

RESULTS OF RECENT RESEARCH ON THE ANOMALOUS RESISTANCE OF A PLASMA

G. E. Vekshtein, R. Kh. Kurtmullaev, and D. D. Ryutov 17 Jun. 1971 24 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-67; CN-28/E-19) Avail: AEC Depository Libraries

The evolution with time of the distribution functions of charged particles in a homogeneous plasma established in an external electric field parallel to the magnetic field was investigated. It was found that if the energy lifetime of the plasma particles is high in relation to the duration of the experiment, and there are no two-body collisions, then some considerable time after the application of the electric field the distribution functions begin to change in a self-simulating way, during which all the velocities increase linearly with time. It is shown that the part played by nonlinear processes in a self-simulating regime is not substantial. A formal investigation was carried out of quasi-linear equations written in self-simulating variables. The effect of Coulomb collisions is assessed, and the finiteness of the energy lifetime of the particles was found. Author (NSA)

N72-10726# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

DISSIPATIVE DRIFT MODES IN TOKAMAK-TYPE CONFIGURATIONS [MODES DE DERIVE DISSIPATIFS DANS LES CONFIGURATIONS DU TYPE TOKAMAK]

J. C. Adam, G. Laval, and R. Pellat 17 Jun. 1971 13 p refs In FRENCH; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison Wis., 17-23 Jun. 1971
(Conf-710607-86; CN-28/F-15) Avail: AEC Depository Libraries

In a toroidal configuration with a large aspect ratio, the curvature of the main field makes it possible to localize drift modes in the outer part of the plasma section. Hence, a means is available for producing perturbations of considerable radial extension, whose phase velocity parallel to the magnetic field remains higher than the ion thermal velocity in spite of the shearing of the field lines. The limits of stability and the growth rate of these modes are determined as a function of collision frequency and temperature gradient on the basis of the Fokker-Planck equation. The existence of trapped electrons is necessary, and this implies an effective collision frequency less than the electron oscillation frequency along the field lines. If the collision frequency is very low, the temperature gradient has a stabilizing effect. For effective collision frequencies much higher than the drift wave frequency, the temperature gradient determines the growth rate, which decreases as the collision frequency increases. Author (NSA)

N72-10727# Commissariat a l'Energie Atomique, Limeil-Brevannes (France). Centre d'Etudes.

STUDY OF PLASMA FOCUS BY THOMSON SCATTERING AND NEUTRON ANISOTROPY DURING NEUTRON EMISSION [ETUDE DU PLASMA FOCUS PAR DIFFUSION THOMSON ET ANISOTROPIE DES NEUTRONS PENDANT L'EMISSION NEUTRONIQUE]

A. Bernard, G. Cesari, A. Coudeville, A. Jolas, J. DeMascureau, and J. P. Watteau 17 Jun. 1971 16 p refs In FRENCH; ENGLISH summary
(Conf-710607-39; CN-28/D-4) Avail: AEC Depository Libraries

No 90 deg scattering is observable during neutron emission. This is attributed to a broadening of the spectrum, which reduces the signal to noise ratio; the broadening could result from the rapid increase in electron temperature, which makes alpha less than 1 and the electron component of the spectrum preponderant as compared with the ion component. To keep alpha greater than 1 during neutron emission, use is made of a 7 deg observation system, which has actually given scattering signals before and during neutron emission. These signals are resolved for lambda using a Fabry-Perot interferometer and 12 photomultipliers. The average number of neutrons were measured with a squirrel cage external electrode. These different conditions are obtained with good coupling between the energy bank and the plasma discharge; neutron emission then takes place when the current is a maximum, and the formation of an arc is avoided upstream of the plasma sheet. Such arcs cause a considerable part of the current to drift and prevent focusing.
Author (NSA)

N72-10728# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

SPATIAL-TIME EVOLUTION OF A PLASMA SUBMITTED TO A DISCHARGE CURRENT [EVOLUTION SPATIO-TEMPORELLE D'UN PLASMA SOUMIS A UN COURANT DE DECHARGE]

C. Mercier, Soubbaramayer, and J. P. Boujot 17 Jun. 1971 19 p refs In FRENCH; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun 1971
(Conf-710607-30; CN-28/C-7) Avail: AEC Depository Libraries

The space-time evolution of a plasma with a Tokamak-type discharge is described in terms of a two-fluid magnetodynamic model, including the Maxwell equations, mass continuity, equations of motion, and energy balance. The following causes of energy loss are taken into account: thermal conduction, ionization of neutrals and reheating of generated particles, charge exchange, and radiations. A choice is allowed for the functional dependence and the amplitudes of the transport coefficients (diffusion, electric resistivity, thermal conductivity) to study the possible effects of impurities, anomalies, and instabilities. This model is the subject of a numerical and theoretical study.
Author (NSA)

N72-10729# Commissariat a l'Energie Atomique, Limeil-Brevannes (France). Centre d'Etudes.

APPLICATION OF LASER PRODUCED DENSE PLASMAS TO CONTROLLED FUSION [APPLICATION A LA FUSION CONTROLEE DES PLASMAS DENSES CREES PAR LASER]

Jean-Louis Bobin, Francis Floux, and Gianfranco Tonon 17 Jun. 1971 29 p refs In FRENCH; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-47; CN-28/D-12) Avail: AEC Depository Libraries

Neutron emission by a deuterium plasma produced from the solid by a powerful laser (5 to 15 GW) was observed. Available fluxes applied to a target are barely an order of magnitude less than the required figures. A neodymium-glass laser (100 J, 3 ns) was used with the beam focused on a solid target. The temperatures measured from the emitted X radiation exceed 1 KeV. Neutron emission exceeds 10,000 per shot. Interferometric arrangements are used to trace the plasma density profile; the exposure time is 1 ns. Using an arrangement consisting of four identical circuits, the interaction between the radioactive deflagration waves was analyzed. A second Nd glass laser (200 J, 30 ns) is used to ionize and heat a granule of deuterium at the center of a magnetic mirror configuration (fields between 300 KG and 1 MG). The plasma confinement due to the field and the diffusion of the field in the plasma are revealed by an interferometric method.
Author (NSA)

N72-10730# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

A REPORT FROM THE GROUP STUDYING THE HEATING OF A PLASMA CONFINED IN A TOKOMAK TYPE MAGNETIC CONFIGURATION [RAPPORT DU GROUP D'ETUDE DU CHAUFFAGE D'UN PLASMA CONFINE DANS UNE CONFIGURATION MAGNETIQUE DE TYPE TOKOMAK]

Jan. 1971 73 p refs In FRENCH
(EUR-CEA-FC-579; DPH-PFC/SCP/SPP) Avail: AEC Depository Libraries

Possibilities of using heating methods both in plasmas near thermonuclear conditions and in Tokamak-type experiments, were tested. Three methods are particularly interesting according to these criteria: transit time magnetic pumping, ion cyclotron absorption, and fast-neutral injection.
NSA

N72-10731# Akademiya Nauk SSSR, Novosibirsk. Inst. Yadernoi Fiziki.

COLLISIONLESS RELAXATION OF AN ULTRARELATIVISTIC ELECTRON BEAM IN A PLASMA

A. T. Altyntsev, B. N. Breizman, A. G. Eskov, O. A. Zolotovskii, V. I. Korotseev, A. Kh. Kurtmullaev, V. L. Masalov, D. D. Ryutov, and V. N. Semenov 17 Jun. 1971 26 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-68; CN-28/E-20) Avail: AEC Depository Libraries

Experimental investigations of the interaction of a relativistic electron beam with a plasma were carried out. Recording of the plasma density and the selection of the point of time for switching on the beam were effected with the help of a microwave interferometer. The working gases were hydrogen and argon. A theory is advanced for the interaction of an ultrarelativistic electron beam with a plasma, taking into account the following effects: the Cherenkov excitement of plasma Langmuir oscillations and their reaction on the beam; nonlinear processes in which a part is played by Langmuir oscillations and, in particular, their scattering on the electrons and ions of the plasma; the destruction of the Cherenkov resonance conditions between the beam and the oscillations excited by it due to inhomogeneity of the plasma; and, finally, the effect on beam relaxation of acoustic turbulence created by an opposing stream of plasma electrons. A relaxation model was constructed in which account is taken of the change in the plasma parameters due to beam heating and the reaction of these changes on the relaxation dynamics.
Author (NSA)

N72-10732# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

NEW METHOD OF MAGNETIC PUMPING FOR PLASMA HEATING [UNE NOUVELLE METHODE DE POMPAGE MAGNETIQUE POUR LE CHAUFFAGE DES PLASMAS]

F. Koechlin and A. Samain 17 Jun. 1971 11 p refs In FRENCH; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971 .
(Conf-710607-138; CN-28/L-2) Avail: AEC Depository Libraries

A method of magnetic pumping for plasma heating is proposed in which torsion of the static field lines is used instead of compression of the field; and the oscillating magnetic field is perpendicular to the static field. The curvature of the lines of force of the static configuration plays an important part in the heating process: the force that heats the particles is the component, along the magnetic perturbation, of the centrifugal force due to thermal motion of the particles. In this case, the most efficient perturbation has the azimuthal wave number 1 around the magnetic axis and around the principal axis. The optimal pumping frequency is of the order of the inverse of the transit time around the principal axis. It is typically three times less than the optimal frequency for compressional magnetic pumping. However, heating of the particles is twice as strong for equal magnetic perturbations. The increase in the heating power due to the electrostatic field accompanying the magnetic perturbation and the plasma diffusion induced by this perturbation were estimated. Author (NSA)

N72-10733# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etude Nucleaires.

NEOCLASSICAL THEORY OF MAGNETIC PUMPING IN TOROIDAL GEOMETRY

Ernesto Canobbio 17 Jun. 1971 17 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(Conf-710607-137; CN-28/L-1) Avail: AEC Depository Libraries

The heating of a low-beta plasma confined in toroidal system by transit time magnetic pumping (TTMP) is investigated in the case of an arbitrary toroidal low frequency magnetic configuration, in the limit of low collision frequency. A toroidal bumpy RF field modulation is considered as produced by a conventional array of meridian coils, a toroidal 1 = 1 helical RF field obtained by properly modulating the current flowing in some helical windings, and the pure radial field produced by Koechlin-Samain coils. It is found that at relatively high current flow, TTMP can be inhibited by overstability. Since the heating rate even at moderate RF power level can be made much larger than the plasma loss rate in low beta tori, it is concluded that TTMP is a powerful potential method to reach reactor tempatures in Tokamaks and stellarators. Author (NSA)

N72-10734# Ministry of International Trade and Industry, Tokyo (Japan). Agency of Industrial Science and Technology.

HEATING INDUCED CONDITIONS AND ITS MECHANISM OF THETA PINCH PLASMAS

Satoru Kiyama and Kiyoshi Ogawa 17 Jun. 1971 12 p ref Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madsion, Wis., 17 Jun. 1971
(Conf-710607-125; CN-28/J-13) Avail: AEC Depository Libraries

The heating rate of plasma at the initial compression phase of the theta pinch is obtained for the various conditions, and its heating mechanism is investigated using a constructed 8-kJ fast theta-pinch device. The magnetic field rise of this theta-pinch device is very large and variable over a wide range, keeping the maximum magnetic field at a fixed value and varying the other parameters. The theta-preheating in this device is almost perfect, employing the transmission energy storage system, and is able to fire even in the very-low-pressure regime below .001 torr. This value of the magnetic field rise where the heating rate changes markedly, and the total absorbed energy by the plasma which is a fairly large fraction of the storage energy of the capacitor bank (up to 30%), almost independent of the initial gas pressure over the wide range (3 to 300 mtorr). Author (NSA)

N72-10735# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.

SHOCK WAVES AND TURBULENT HEATING IN LOW DENSITY PLASMAS

P. Bogen, K. J. Dietz, K. H. Dippel, E. Hintz, K. Hoethker, F. Siemsen, and G. Zeyer 17 Jun. 1971 17 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-123; CN-28/J-11) Avail: AEC Depository Libraries

Shock heating and shock structures were studied in theta-pinch-like devices in a wide range of plasma parameters and wave speeds. Densities and temperatures were determined locally by interferometry and by Thomson scattering. Magnetic and electric fields were measured with small high-frequency probes. Previous investigations of perpendicular, hydromagnetic shocks at beta sub 1 much less than 1 and M sub A less than M sub A(critical) at densities above 10 to the 14th power/cu cm were extended to densities close to 10 to the 13th power/cu cm and to other mass ratios m sub e/m sub i. The shocks were nearly collision-free even with respect to the initial state. A scaling law was obtained for the effective collision frequency, deduced from measured turbulent heating rates and current densities. Author (NSA)

N72-10736# Akademiya Nauk URSR, Kiev. Institut Yadernykh Issledovanii.

EXPERIMENTAL RESEARCH ON THE COLLISIONLESS RELAXATION OF ION STREAMS IN A PLASMA

A. G. Borisenko, G. S. Kirichenko, and V. G. Khmaruk 17 Jun. 1971 23 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madsion, Wis., 17 Jun. 1971
(Conf-710607-58; CN-28/E-10) Avail: AEC Depository Libraries

The trend in the distribution function of a monoenergetic ion beam introduced into a plasma and the spectra of excited ion-acoustic oscillations were investigated. The experiments were carried out under conditions of a beam-plasma discharge in a longitudinal magnetic field and in a low-pressure plasma without a magnetic field over the following range of conditions; plasma concentration 10 to the 9th power to 10 to the 10th power 1/cu cm electron temperature 5 to 50 eV, beam current 1 to 2 mA. It was found that the effectiveness and nature of the interaction is determined by the ratio of the beam velocity to the velocity of the nonisothermic ion sound, where the interaction between the beam and the excited ion-acoustic oscillations leads to the establishment initially of a plateau, and subsequently to a distribution function of the beam ions with a negative derivative and the occurrence of anomalously accelerated particles. Author (NSA)

N72-10737# Akademiya Nauk SSSR, Novosibirsk. Inst. Yadernoi Fiziki.

BEHAVIOR OF A PLASMA IN A STELLARATOR, FOR THE CASE OF LARGE ELECTRON FREE PATH LENGTHS

V. N. Bocharov, V. I. Volosov, A. V. Komin, V. M. Panasyuk, and Yu. N. Yudin 17 Jun. 1971 25 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-101; CN-28/H-1) Avail: AEC Depository Libraries

Characteristics of plasma behavior in a stellarator were studied under conditions where the electron free-path length is larger than or of the order of the longitudinal wavelength of drift oscillations. The relationship between the plasma decay process and the main parameters of the experiment was investigated. The structure of the oscillations (wavelength, frequency and correlative dimensions) accompanying plasma decay was studied. Measurements were also made of the radial plasma flows caused by these oscillations. The characteristic oscillation frequencies of the potentials, electric fields, and density of the plasma are close to the drift frequency, and their dependence on the magnetic field, electron temperature, and other parameters coincides with drift theory predictions. Author (NSA)

N72-10738# Institut fur Plasmaphysik G.m.b.H., Garching (West Germany).

HIGH BETA (1 EQUALS 1)-STELLARATOR EXPERIMENTS

E. Fuenfer, M. Kaufmann, W. Lotz, and J. Neuhauser 17 Jun. 1971 13 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-115; CN-28/J-3) Avail: AEC Depository Libraries

Experiments were done in straight as well as in toroidal geometry. In all cases the plasma was heated by shock waves (theta-pinch). In straight helical geometry, a 5.4-m-long coil was used in essentially four different versions. In all cases the typical plasma helix was formed after the fast compression. From internal magnetic probe measurements, magnetic field profiles and beta values were derived. The field profiles indicated that longitudinal currents also flow in the thin plasma halo outside the dense plasma column. Such currents may influence the plasma stability. Author (NSA)

N72-10739# Japan Atomic Energy Research Inst., Tokai.
THERMAL INSTABILITY AND CONTROL OF FUSION REACTOR
M. Ohta, H. Yamato, and S. Mori 17 Jun. 1971 14 p Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-132; CN-28/K-8) Avail: AEC Depository Libraries

Steady state fusion reactors will be achieved with plasmas of charged particle heating or injection heating. The temperature and density of these plasmas can be unstable for deviations from the steady state. The stability criteria are obtained from linearized equations for deuterium-tritium plasma, taking into account the difference between energy and particle confinement times. The possibility of control of these instabilities is also discussed. There seems to be a critical operating temperature, above which the reactor is stable. This temperature is determined from the functional dependence of the energy and particle confinement times on the temperature and density.
Author (NSA)

N72-10740# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.
ELECTROMAGNETIC MODES OF PARTICLES TRAPPED IN MULTIPOLES Ph.D. Thesis - Paris Univ., Feb. 1971
[MODES ELECTROMAGNETIQUES DE PARTICULES PIEGEES DANS LES MULTIPOLES]
Marie-Noelle Bussac Dec. 1970 42 p refs In FRENCH
(EUR-CEA-FC-574; DPH-PFC/STG) Avail: AEC Depository Libraries

The stability criteria of a collisionless plasma, confined by a magnetic field whose lines of force are not sheared, are calculated using magnetohydrodynamic and microscopic models. The influence of a finite pressure on the trapped particle instability is studied.
NSA

N72-10741# United Kingdom Atomic Energy Authority, Culham (England).
FAST NEUTRAL INJECTION FOR PLASMA HEATING AND REACTOR START-UP
D. R. Sweetman, A. C. Riviere, H. C. Cole, E. Thompson, D. P. Hammond, J. Hugill, and G. M. McCracken 17 Jun. 1971 17 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(Conf-710607-130; CN-28/K-5) Avail: AEC Depository Libraries

The injection of fast neutral atoms for the heating of toroidal reactors is considered. The requirement for fast deuterons to penetrate into the plasma necessitates an energy of the order of 1 MeV. The basic energy transfer rates from the trapped particles are adequate, though the energy reaches the plasma ions mainly via the electrons unless E sub zero is approximately less than 70 T sub e (where E sub 0 is the energy of the incident particles). The startup requirements are considered for a typical 7000-MW(th) toroidal reactor system. Basic ion source and accelerator considerations lead to the likely further subdivision of the beam during the early acceleration stages. The low efficiency for neutralization precludes the use of a D(+) primary beam. Various other possibilities are considered, including D2(+), D3(+), and D(-). The use of the Hall accelerator as an alternative ion source is considered. Hall accelerators were operated at potentials up to 20 kV, and measurements of current output, efficiency, and divergence are presented. Author (NSA)

N72-10742# Akademiya Nauk URSR, Kiev. Inst. Yadernykh Issledovanii.
EFFECT OF FUSION REACTIONS ON THE OPERATION OF THERMONUCLEAR DEVICES
V. S. Belikov, Ya. I. Kolesnichenko, and V. N. Oraevskii 17 Jun. 1971 21 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(CN-28/K-7; Conf-710607-131) Avail: AEC Depository Libraries

During the operation of thermonuclear devices, fusion reactions results in the occurrence in the plasma of charged particles, the energy of which considerably exceed the thermal energy of the reacting ions. If the cross section of the device is not too small, these charged particles will not escape from the plasma confinement zone. The question arises how the accumulation of fusion-reaction products affects the equilibrium of the plasma configurations and the transfer processes in them. One of the factors on which plasma confinement depends is the occurrence of an electric field as a result of the relatively large Larmor radius of the ions formed in thermonuclear reactions. The effect of this type on the equilibrium and stability of the plasma configurations is discussed. Another factor influencing plasma stability is the thermodynamic nonequilibrium of the distribution function of the thermonuclear reaction products. This nonequilibrium is the reason for the occurrence of an extensive class of kinetic instabilities that develop in periods much shorter than the characteristic Coulomb collision times. Author (NSA)

N72-10743# Academy of Sciences (USSR), Moscow.
INVESTIGATION OF ION-CYCLOTRON INSTABILITY IN A PLASMA FORMED BY FAST IONS IN A MAGNETIC MIRROR TRAP
A. V. Bortnikov, N. N. Brevnov, V. G. Zhukovskii, V. I. Pergament, and M. K. Romanovskii 17 Jun. 1971 32 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(Conf-710607-95; CN-28/G-8) Avail: AEC Depository Libraries

At the moment when the fast ions are filling the trap they either rotate coaxially with the axis, forming a thin cylindrical layer, or fill the cross section of the trap. Trapping is accomplished with the help of the pulsed magnetic field constituting one of the mirrors. The behavior of the plasma is very different in the two cases. In the first case, a low noise level is observed before trapping of the plasma. After trapping in the magnetic mirror trap, however, ion-cyclotron oscillations develop in the plasma. In the second case, strong ion-cyclotron oscillations are observed before trapping of the plasma (in the penetrating beam regime) if the plasma density exceeds some threshold value. Only the basic ion-cyclotron frequency is observed in the HF oscillation spectrum when the plasma density is near the threshold value.
Author (NSA)

N72-10744# Akademiya Nauk URSR, Kharkov. Fiziko-Tekhnicheskii Inst.
EXPERIMENTS ON HIGH-FREQUENCY HEATING OF A PLASMA IN A TOROIDAL TRAP
S. S. Ovchinnikov, S. S. Kalinichenko, V. I. Kurilko, O. M. Shvets, and V. T. Tolok 17 Jun. 1971 28 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(Conf-710607-144; CN-28/L-8) Avail: AEC Depository Libraries

The excitation and propagation of low-frequency waves in a high-density plasma contained in a toroidal trap were studied. The plasma was produced by means of an electron beam. Conditions were found for the effective introduction of high-frequency power into the plasma by means of exciting devices arranged inside the conducting vacuum chamber. A study of the structure of the excited waves shows that axially asymmetric waves are those most effectively produced in a toroidal plasma. The possibility of heating the plasma ions to high energies with axially asymmetric ion-cyclotron waves was experimentally investigated. The high-frequency power was introduced at high levels by an exciting device that creates in the plasma a spatially periodic transverse high-frequency field. For recording of the plasma heating, the diamagnetic signal was measured. The ion energy spectrum was analyzed.
Author (NSA)

N72-10745# Akademiya Nauk URSR, Kharkov. Fiziko-Tekhnicheskii Inst.

RESEARCH ON HIGH-FREQUENCY HEATING OF A PLASMA

L. I. Grigoreva, A. V. Longinov, A. I. Pyatak, V. L. Sizonenko, B. I. Smerdov, K. N. Stepanov, and V. V. Chechkin 17 Jun. 1971 30 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971
(Conf-710607-143; CN-28/L-7) Avail: AEC Depository Libraries

It is shown that the high frequency method of plasma heating employing a collisionless wave absorption mechanism under resonance conditions can ensure heating of a dense plasma of large dimensions to thermonuclear temperatures. The absorption of the high-frequency energy is affected by resonance particles. The Coulomb collisions of these particles with the remaining particles of the plasma prevent the formation of a plateau in the distribution function and ensure heating of all the plasma. Attention is devoted to the heating of a large volume of plasma with the help of fast magneto-acoustic waves and forced oscillations. A theoretical investigation was made of the turbulence of a plasma with a transverse current for the case in which the relative velocity of the electrons and ions U is considerably less than the electron thermal velocity. Author (NSA)

N72-10746# United Kingdom Atomic Energy Authority, Culham (England).

DEVELOPMENT OF AMBIPOLAR ELECTRIC FIELD AND FLOWS IN TOROIDAL PLASMAS

T. E. Stringer 17 Jun. 1971 12 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/F-3; Conf-710607-74) Avail: AEC Depository Libraries

The development of poloidal and toroidal flows in an axisymmetric collisional plasma, in a Tokamak-like magnetic field, is studied. A radial electric field builds up to equalize the ion and electron diffusion rates, leading to poloidal rotation. Time rates of change terms are included as correction terms in the first-order equations. It is known that in the weak collisional regime the ambipolar state requires a diffusion-driven current parallel to the magnetic field, in addition to any externally driven currents. A general equation is derived relating the build-up of such a parallel current and mass flow to pressure anisotropy and temperature variation. In typical experimental conditions, the ambipolar value of the diffusion-driven current is found to fall off inversely as the collision frequency over the intermediate collisional range. Author (NSA)

N72-10747# Academy of Sciences (USSR), Moscow.

MAINTAINING EQUILIBRIUM IN THE UNCASED TO-1 TOKAMAK DEVICE BY MEANS OF A FEEDBACK SYSTEM

L. I. Artemenkov, I. N. Golovin, P. I. Kozlov, P. I. Milikhov, N. N. Shvindt, V. K. Butenko, Yu. P. Ladikov-Roev, A. N. Kukhtenko, Yu. I. Samoilenko, and V. F. Gubarev 17 Jun. 1971 8 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/C-3; Conf-710607-72) Avail: AEC Depository Libraries

A system was designed for automatically controlling the equilibrium position of the plasma column in a Tokamak device without copper casing, using an arrangement of spaced windings and regulators. The TO-1 Tokamak device was built for this study. The single-wall vacuum chamber is made of 1-mm stainless steel with a ceramic insert. The chamber has four diagnostic tubes spaced uniformly around the torus. Between the solenoid of the longitudinal field and the vacuum chamber there is a system of spaced windings consisting of eight sections; four sections are above the equatorial plane of the torus and four below. The windings can be connected with one of three regulators, depending on the distribution of the stray magnetic fields. The type of regulator adopted is for a maximum plasma current of 30 kA. When there is no plasma current, the systems uses virtually no power. With this regulator system it is possible to reduce the displacement of the plasma column by comparison with the displacement that occurs when a superconducting casing is used. Author (NSA)

N72-10748# Institut Atomnoi Energii, Moscow (USSR).

INVESTIGATION OF MACROSCOPIC INSTABILITIES OF A PLASMA COLUMN IN TOKAMAK DEVICES

S. V. Mirnov and I. B. Semenov 17 Jun. 1971 8 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/F-5; Conf-710607-76) Avail: AEC Depository Libraries

An investigation was carried out in Tokamak-3 and Tokamak-4 of the instabilities of a plasma column that occurred when q = (H sub z/H sub phi) (a/R) (where H sub z is the stabilizing magnetic field, H sub phi the longitudinal current field, a the minor radius of the column, and R the major radius) assumes the integral values: 3, 2 and 1. It was demonstrated that, for these conditions at the column boundary, a resonance-type instability develops, with m/n = q (where m and n are the transverse and longitudinal azimuthal numbers). The reduction of q right down to unity was achieved by increasing the longitudinal current during discharge. If q near the boundary does not assume integral values, the plasma column becomes more stable than when resonances are present. In addition to the instability with integral q values close to the boundary, the plasma column instabilities that occur when the plasma density is increased to the critical value and also the instabilities arising when the plasma loop is widened under the influence of transverse magnetic fields were studied. Author (NSA)

N72-10749# Academy of Sciences (USSR), Moscow. Inst. Fiziki.

AN INVESTIGATION OF THE CONFINEMENT OF A DENSE PLASMA IN THE TOR-1 STELLARATOR

D. K. Akulina, E. D. Andryukhina, Yu. I. Nechaev, O. I. Fedyanin, and Yu. V. Kholnov 17 Jun. 1971 29 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison Wis., 17-23 Jun. 1971
(CN-28/H-2; Conf-710607-102) Avail: AEC Depository Libraries

Confinement conditions are investigated as functions of the collision frequency, the rotational transform angle, and the intensity of the magnetic field. Use was made of the uhf method of creating and heating plasma, permitting a transition to substantially higher collision frequencies (dense plasma). An investigation of a wide range of changes in the collision frequencies (Coulomb-type collision and collisions with neutrals) with a transition to the region of hydrodynamics was carried. An investigation was also carried out for the relationship between the plasma lifetime and the rotational transform angle, the density of the magnetic field, the temperature of the electrons, and the density. The experimental results were compared with those obtained on the basis of classical diffusion theory. Author (NSA)

N72-10750# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

EXPERIMENTS ON CONFINEMENT OF A PLASMA IN A CIRCULAR MAGNETIC WELL, DECA 2 B [EXPERIENCE DE CONFINEMENT D'UN PLASMA DANS UN PUITS MAGNETIQUE CIRCULARISE: DECA 2 B]

D. Launois, P. Lecoustey, M. Nicolas, J. Tachon, and J. Kesner 17 Jun. 1971 10 p refs In FRENCH; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-1; Conf-710607-88) Avail: AEC Depository Libraries

The quadrupolar magnetic well used in the DECA experiment was modified to reduce the plasma-wall interaction. Two quadrupolar windings, situated on both sides of the well, focus the magnetic lines. The tube of flux contained in the chamber (diameter 40 cm) has a radius of 4 cm in the median plane. The inlet mirror of the configuration is cancelled by a

pulsed field to permit injection of the plasma produced by an induction gun. After the transitory capture phase, in the case of the regime studied most intensively, the plasma has a density of 3 x 10 to the 11th power/cu cm at the center of the well. The half-height width of the density profile is 6 cm. The mean ion energy is 500 to 700 eV, and the half-height width of the spectrum is 400 eV. For a base pressure of 2 x 10 to the minus 7th power torr, with no titanium evaporation on the walls, the time constant for density decrease is 400 microseconds, this value is maintained during the observation time of 3 ms.
Author (NSA)

N72-10751# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

THE FORMATION OF PLASMA BY INJECTION AND DISSOCIATION OF ACCELERATED HYDROGEN GRANIONS [FORMATION DE PLASMA PAR INJECTION ET DISSOCIATION DE GRANIONS D'HYDROGEN ACCELERES]

F. Bottiglioni, J. Coutant, M. Fois, and F. Prevot 17 Jun. 1971 10 p refs In FRENCH; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-2; Conf-710607-89) Avail: AEC Depository Libraries

An experimental study was made of the formation of a hot ion plasma by the injection, dissociation, and capture of a beam of accelerated hydrogen granions in a magnetic configuration. The granions are agglomerates of hydrogen atoms with one or more positive electric charges. The accelerator is described. Mass analysis of the accelerated beam was was carried out by means of a magnetic separator, which can be used for analyzing mass/charge numbers N/Z up to 10,000 at 600 keV. To take into account the reduced mean mass in the ionizer, a model is proposed that assumes that when an electron ionizes a granion that has already been singly charged, the granion dissociates spontaneously by electrostatic repulsion into two granions of complementary mass, each with a charge. The calculations based on this model for different forms of a probability p(f) with an ionization cross section proportional to N to the 2/3 power are in good agreement with experimental results. Author (NSA)

N72-10752# Commissariat a l'Energie Atomique, Fontenay-Aux-Roses (France). Centre d'Etudes Nucleaires.

CONTAINMENT OF PULSE-HEATED PLASMA IN AN OCTOPOLAR MINIMUM-B CONFIGURATION [CONFINEMENT D'UN PLASMA CHAUFFE PAR IMPULSION DANS UN PUITS MAGNETIQUE OCTOPOLAIRE]

J. Jacquinot, C. Leloup, J. P. Poffe, M. DePretis, and P. Evrard 17 Jun. 1971 12 p refs In FRENCH; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-3; Conf-710607-90) Avail: AEC Depository Libraries

Investigations were performed on the containment of a plasma injected by a gun with no electrodes into a deep octopolar minimum-B configuration consisting of a magnetic mirror trap with a 1.9 length ratio and eight stabilizing rods. The trapping of the plasma is achieved by increasing its perpendicular energy through the action of a pulse of axial magnetic field B (pulse duration 1.7 microseconds). This pulsed field escapes from the containment field and two types of plasma are obtained, depending on whether or not inversion of the direction of the resultant field occurs. A high-speed titanium pump unit is installed in the injection stage, in the magnetic well, and in the plasma jet expansion stage. The characteristics of the plasma obtained under these conditions are presented. Author (NSA)

N72-10753# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.

RECENT DEVELOPMENTS OF THE PLEIADE DEVICE [DEVELOPPMENTS RECENTS DE LA MACHINE PLEIADE]

R. Geller, B. Jacquot, and C. Jacquot 17 Jun. 1971 21 p refs In FRENCH; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-6; Conf-710607-93) Avail: AEC Depository Libraries

In the accelerating structure (hf power 500 W) energetic electrons are created by ECR (3000 MHz) in a static B gradient. In the VB, ions are accelerated by a space charge field due to the motion of the electrons. The electron reflecting structure is constituted by a pulsed mirror creating a symmetrical space charge field for ion reflection. In this manner, energetic spiraling electrons and axially accelerated ions are accumulated. Accumulation ratios are obtained in the range of .000001 torr by measuring the leaking fast neutrals on the axis with a digital counting system. The energetic ion lifetime and the accumulation ratio vary with neutral pressure in the magnetic bottle as the reciprocal of neutral pressure. The results show also that stable accumulation is possible during the entire mirror pulse and that charge exchange is the limiting loss mechanism for the energetic ions. Author (NSA)

N72-10754# Academy of Sciences (USSR), Moscow.

INVESTIGATION OF PLASMA DECAY IN THE PR-6 ADIABATIC TRAP

Yu. T. Baiborodov, M. S. Ioffe, B. I. Kanaev, R. I. Sobolev, and E. E. Yushmanov 17 Jun. 1971 24 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-7; Conf-710607-94) Avail: AEC Depository Libraries

The injection technique was modified by modernizing the plasma source and using a HF radial electric field for ion heating. Confinement of the plasma was studied by measuring the rate of free decay of the plasma after injection had ceased. Various characteristics of the decaying plasma and their time variations were studied: plasma density (measured by means of a radio interferometer); integral flux of charge exchange neutrals; differential fluxes of charge exchange neutrals in different energy ranges from 200 eV upwards; plasma potential; and ion and electron streams through the magnetic mirrors. A comparison of these characteristics indicates that the decay of a plasma with a high initial density proceeds in an anomalous manner.
Author (NSA)

N72-10755# Academy of Sciences (USSR), Moscow.

A POSSIBLE METHOD OF OBTAINING A COLLISIONAL PLASMA IN A MAGNETIC MIRROR TRAP

I. N. Golovin, K. B. Kartashev, V. I. Pistunovich, V. V. Platonov, V. D. Ryutov, and E. A. Filimonova 17 Jun. 1971 21 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. of Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971
(CN-28/G-9; Conf-710607-96) Avail: AEC Depository Libraries

Conditions for suppressing the high-frequency cone instability were studied. Methods were studied for producing a plasma with an ion distribution function that is as close as possible to equilibrium from the very outset. The possibility of trapping, in a magnetic mirror trap, a dense bunch of fast atoms injected perpendicular to the direction of the magnetic field over a period of 10 to 20 microseconds is discussed. Such a bunch of fast atoms results from the charge exchange of a plasmoid containing ions with a wide velocity spread in a gaseous magnesium target. The bunch of atoms is trapped as a result of charge exchange in a short-lived plasma target within the trap itself. The plasma-target is produced by injecting a plasmoid from the second plasma gun along the magnetic field lines.
Author (NSA)

N72-10756# United Kingdom Atomic Energy Authority, Culham (England).

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF PLASMA BUILD-UP AND MICROINSTABILITIES IN A NEUTRAL INJECTION MIRROR MACHINE

E. Thompson, J. G. Cordey, and D. R. Sweetman 17 Jun. 1971 17 p refs Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(CN-28/G-10; Conf-710607-97) Avail: AEC Depository Libraries

Plasma trapping and the onset of exponentiation on the contained hot plasma in a high energy injection experiment are described. The value of the cross section for plasma trapping deduced from these measurements is 2.8 x 10 to the minus 15th power sq cm, whereas a theoretical esimate yields a value of 4.6 x 10 to the minus 15th power sq cm. Further investigations of the microinstability have shown that the threshold density for instability is determined by electron Landau damping. Both the scaling and absolute measurements of the thresholds are in very good agreement with theoretical calculations. The anomalous loss of hot ions due to the microinstability was measured and is characterized by a diffusion time of approximately 0.2 sec. Increasing the radial (and hence axial) magnetic well depth results in a 50% reduction of the loss rate. Author (NSA)

N72-10757# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

INVESTIGATIONS OF PLASMA CONFINEMENT AND HEATING IN THE TOKAMAK T-4 DEVICE

L. A. Artsimovich, V. A. Vershkov, E. P. Gorbunov, V. S. Zaveryaev, D. P. Ivanov, S. E. Lysenko, S. V. Mirnov, M. P. Petrov, I. B. Semenov, and V. S. Strelkov 17 Jun. 1971 8 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/C-8; Conf-710607-31) Avail: AEC Depository Libraries

Experimental studies of plasma column equilibrium, plasma energy balance, and ion heating are described. Since the main results are obtained with relatively high plasma concentrations, it is assumed that the transfer of energy from the electrons to the ions is due principally to Coulomb pair collisions. On the basis of this assumption, the ion energy lifetime is determined from the steady-state ion temperature and the known concentration of the plasma. The ion temperature is determined from the spectrum of the charge-exchange atoms, the intensity of neutron emission, and Doppler broadening of the hydrogen and deuterium spectral lines. Calculation of the total plasma energy is based on the diamagnetic effect. The experimental values obtained are compared with values calculated on the basis of extrapolation functions and with the results of calculations performed on the basis of the Galeev-Sagdeev theory. Author (NSA)

N72-10758# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

ADVANCES IN RESEARCH ON TURBULENT HEATING OF A PLASMA

E. K. Zavoiskii, B. A. Demidov, Yu. G. Kalinin, A. G. Plakhov, L. I. Rudakov, V. D. Rusanov, V. A. Skoryupin, G. E. Smolkin, A. V. Titov, S. D. Fanchenko et al 17 Jun. 1971 44 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-1; Conf-710607-49) Avail: AEC Depository Libraries

The physical state of the plasma was investigated under conditions of turbulent heating by a current, shock waves, and an electron beams. In the NPR-2 device, the change with time was studied of an epithermal ultrahigh frequency radiation spectrum, and the Stark profiles of the optical spectral lines were analyzed. The results confirm the ion-acoustic mechanism of anomalous resistance of the plasma. The strong anisotropy of the turbulent ion-acoustic oscillations is demonstrated. The energy distribution of the ions during turbulent heating of the plasma by the direct discharge current was measured in the TN-5 device. In the Vikhr-2 toroidal trap the relationship was investigated between the anomalous resistance of the plasma and the mass of the ions. In the T-2M toroidal trap an investigation was carried out of turbulent heating by a current pulse. On the basis of the Stark broadening of the spectral lines of hydrogen and helium in UV-2, it was established that, upon the passage of a shock wave, intense electric oscillations are caused at ion-acoustic and lower frequencies. Author (NSA)

N72-10759# United Kingdom Atomic Energy Authority, Culham (England).

EXPERIMENTS ON PLASMA HEATING BY THE DISSIPATION CURRENT DRIVEN TURBULENCE

S. M. Hamberger, J. Jancarik, L. Sharp, D. Aldcroft, and A. Wetherell 1971 13 p

(CN-28/E-3; Conf-710607-51) Avail: AEC Depository Libraries

Experiments were conducted on TWIST (a small toroidal stellarator with R = 32 cm, r = 5 cm B sub phi = 3 kgauss, i = 120 deg, l = 3) in which turbulence is generated by applying axial electric fields up to 500 V/cm in pulses to plasma having various ion masses. It was found that the nature of the dependence of the conductivity sigma on the experimental parameters changes with the type of microfluctuation spectrum present, which was studied using both electric probes and electromagnetic wave scattering. To study the electron heating, both the X-ray spectrum emitted from an immersed solid target and the bremsstrahlung at a wavelength at which no nonthermal emission could be detected were measured. It was found that the electrons very rapidly acquire high energy in the fluctuating fields and thermalize to a true temperature approximately 10 keV as the turbulence decays. The time dependent velocity distribution of the ions was measured from the flux of charge exchange neutrals ejected radially from the magnetic trap corrected for the time-of-flight between the plasma and the final detector. Author (NSA)

N72-10760# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

ENERGY BALANCE AND DYNAMICS OF PLASMA HEATING BY A BEAM OF ELECTRONS ACCELERATED IN A STRAIGHT HIGH-CURRENT DISCHARGE

A. I. Karchevskii and Yu. I. Strakhov 17 Jun. 1971 34 p refs In RUSSIAN; ENGLISH summary Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-21; Conf-710607-69) Avail: AEC Depository Libraries

Anomalous energy losses through the grid anode of a straight high-current discharge excited in a hydrogen plasma with an initial density of 10 the 12th power to (6 x 10 to the 13th power)/cu cm and an initial electron temperature of severla electron volts were studied in the Aspa device. The straight discharge is excited along a magnetic field of 1500 Oe by means of a 0.2 microfarad capacitor bank charged to 5 to 50 KV. The frequency of the straight discharge circuit is 640 Kc. It is shown that, depending on the initial plasma density and the applied electric field, there develops in the discharge an instability that manifests itself in anomalous plasma resistance and a subsequent interruption of the discharge current. Approximately 0.1 microsecond before the current is interrupted and throughout the interruption approximately 0.2 microsecond there are generated in the straight discharge beams of accelerated electrons with an energy of the order of the voltage applied to the plasma and a current comparable with the total discharge current. Author (NSA)

N72-10761# Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas (Netherlands). Inst. voor Plasma-Fysica.

TURBULENT HEATING OF A PLASMA COLUMN IN A LINEAR DISCHARGE

H. de Kluiver, H. W. Piekar, W. R. Rutgers, H. Schrijver, and B. DeGroot 17 Jun. 1971 9 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(CN-28/E-5; Conf-710607-53) Avail: AEC Depository Libraries

The heating and subsequent expansion of a hydrogen plasma column by the application of supercritical fields is reported. A 15 mm diameter plasma column, length 0.6 m, is produced by a hollow cathode discharge. The turbulent state is excited by discharging a capacitor across the length of the plasma column. During turbulence, the time dependence of the anomalous resistance is determined with a fast digitizing technique under widely different conditions of arc parameters and electric field strengths. Considerable plasma heating is measured for electron cyclotron frequencies below the electron plasma frequencies. The ion energy distribution is measured at various electric field strengths and heating times. Author (NSA)

N72-10762# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

CONFINEMENT OF A DENSE TURBULENTLY HEATED PLASMA IN THE OGRA-2T DEVICE

V. A. Zhiltsov, A. N. Karkhov, V. Kh. Likhtenshtein, and D. A. Panov 17 Jun. 1971 14 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phy. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-6; Conf-710607-54) Avail: AEC Depository Libraries

It is shown that, when a discharge from a capacitor bank with an energy storage capacity of several kilojoules passes through a plasma, two heating stages are observed. The first stage is associated with the development of an ion-acoustic instability, the second with the generation of a beam of fast electrons and the development of a beam instability. The fast ion component of the plasma is investigated. Measurements with an electrostatic analyzer show that the ion spectrum occupies a wide energy interval which completely covers the operating range of the analyzer (0.5 to 120 keV). The mean ion energy obtained from these measurements is 3 to 10 keV. The mean energy of all the ions in the plasma is 2 to 3 keV. The energy of the fast ion component is equal in order of magnitude to the total plasma energy. Measurements of the rate of decay of the ion component in various parts of the energy spectrum show that it remains virtually the same in the range 0.5 to 120 keV. Author (NSA)

N72-10763# Akademiya Nauk URSR, Kharkov.

NEUTRON MEASUREMENTS OF THE EFFICIENCY OF CURRENT TURBULENT HEATING OF IONS AND OF THE CONFINEMENT OF A HOT HIGH-DENSITY PLASMA IN A MAGNETIC MIRROR TRAP

N. A. Manzyuk, N. I. Reva, V. A. Suprunenko, E. A. Sukhomlin, A. M. Ternopol, and V. T. Tolok 17 Jun. 1971 21 p refs In RUSSIAN; In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-7; Conf-710607-55) Avail: AEC Depository Libraries

An investigation was made of turbulent heating and the confinement of a dense plasma associated with a high current gas discharge in a magnetic field of the mirror type (H max = 50 koe, H min = 25 koe), the distance between the mirrors being 30 cm, and the working gas deuterium. The heating and confinement time of the plasma were determined on the basis of the full yield of neutrons per pulse measured with a Born counter and on the basis of the diamagnetic effect determined by a loop encompassing the discharge chamber. Author (NSA)

N72-10764# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

THE MECHANISM OF TURBULENT HEATING AND OF LOSSES IN TOKAMAK DEVICES

L. I. Rudakov 17 Jun. 1971 21 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-15; Conf-710607-63) Avail: AEC Depository Libraries

It is suggested that anomalous resistance may be caused in a strong magnetic field by the instability of shortwave ion Langmuir oscillations. The laws of turbulent heating of ions are examined. It is shown that the characteristic time for losses of the hot component of the ions is determined by classical diffusion in toroidal systems due to scattering on the fluctuations of the electric field, which result in an anomalous plasma resistance and heating of the electrons and ions. When there is anomalous conductivity under the conditions of the experiments, development of a superheating instability in an even more pronounced form than in the case of Coulomb conductivity is possible. As a result of this, the main part of the current should flow through thin high-conductivity filaments submerged in a plasma with a lower temperature and a higher resistance and thermal conductivity. It is then possible to reconcile the experimental value for the energy lifetime taking into account the real value of the effective frequency of electron scattering. Author (NSA)

N72-10765# Akademiya Nauk Gruzinskoi SSR, Tiflis. Institut Fiziki.

DYNAMICS OF PLASMA HEATING IN COLLISIONLESS HIGH-AMPLITUDE SHOCK WAVES

D. G. Lominadze and A. D. Pataraya 17 Jun. 1971 14 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971

(CN-28/E-22; Conf-710607-70) Avail: AEC Depository Libraries

The theory of the transiton region to higher Mach numbers was studied. The initial stage of the transition is caused by an anomalous resistance to the ion sound, after which in a plasma of this type with an electron distribution, a subshock of an electrostatic nature is produced under the influence of ion-acoustic turbulence. A theory was constructed with respect to this subshock on the basis of an electron distribution function which is established after the anomalous resistance to the ion sound. A critical Mach number, subnumber M^*, is introduced which, as is shown by calculation is $M^* = 3.5$. It is shown that when $M > M^*$ the subshock is inhibited and fast ions occur. The mechanism of ion heating is examined when $M > M^*$ and when the subshock is inhibited. Author (NSA)

N72-10766# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

RADIATION LOSSES IN CERTAIN THERMONUCLEAR SYSTEMS

Yu. I. Galushkin, V. I. Gervids, and V. I. Kogan 17 Jun. 1971 18 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis.

(CN-28/F-6; Conf-710607-77) Avail: AEC Depository Libraries

Radiation losses in the Tokamak system are discussed. The impurities are assumed to be carbon, oxygen, and other elements. The results of the calculations show that it is very important to allow for the effect of nonstationary conditions. Radiation losses in the plasma focus system are also discussed. Detailed numerical calculations are made of the level populations of the impurity ions and of the corresponding radiation losses from a hydrogen plasma for a wide range of electron temperatures and concentrations. Impurity ions with charge numbers are considered on the assumption that the plasma is stationary and optically thin, which corresponds to the conditions of a plasma focus. Ionization and excitation processes in a collision-radiation system are considered. It is shown that the characteristic emission times of the plasma can be comparable with the focus lifetime and, consequently, that radiation can affect the focus parameters considerably. Author (NSA)

N72-10767# I. V. Kurchatov Inst. of Atomic Energy, Moscow (USSR).

EXPERIMENTS IN THE TOKAMAK-6 DEVICE

N. D. Vinogradova, V. S. Vlasenkov, E. P. Gorbunov, V. M Leonov, V. S. Mukhovatov, M. P. Petrov, and L. D. Sinitsyna 17 Jun. 1971 12 p refs In RUSSIAN; ENGLISH summary Presented at the 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971

(CN-28/F-8; Conf-710607-79) Avail: AEC Depository Libraries

The experiments were carried out with a longitudinal magnetic field intensity of up to 15 koe. The electron density in the plasma column was measured with the help of a multichannel microwave interferometer. The thermal energy of the plasma was determined on the basis of the diamagnetic effect. For measurement of the ion temperature, spectral analysis of the

neutral charge-exchange atoms was used. The relationship between the energy lifetime of the plasma and various parameters, including the radius of the diaphragm opening, is shown. The temperatures of blocked and in-transit ions are also compared.
Author (NSA)

N72-10768# Institute of Nuclear Research, Warsaw (Poland).
ON SOME EFFECTS IN THE BOUNDARY LAYERS IN THE MHD GENERATOR CHANNEL
Z. Celinski 1971 42 p refs
(INR-1244) Avail: AEC Depository Libraries

Some interesting physical phenomena occur in the gas in the Faraday-type MHD generator when the gas parameters vary in tye cross-sectional area of the generator channel. They will be concentrated in the gas boundary layers where the largest gradients of the gas velocity and gas temperature are attained. The distributions of the electrical quantities in the gas boundary layers are calculated, and some physical effects are discussed.
Author (NSA)

N72-10769# Institute of Nuclear Research, Warsaw (Poland).
REDUCTION IN THE ELECTRICAL PERFORMANCE OF AN MHD GENERATOR DUE TO THE GAS BOUNDARY LAYERS
Z. Celinski 1971 27 p refs
(INR-1245) Avail: AEC Depository Libraries

Expressions are derived that enable one to calculate the electrical terminal values of a Faraday-type MHD generator with two-dimensional gas flow. These expressions are based on the simple generator theory and three correction parameters. The parameters are defined and their numerical values calculated for various thickness of the gas boundary layers, for various wall temperatures, and for various Hall parameters. The cool electrode boundary layers deteriorate the generator performance significantly. The cool boundary layers in the vicinity to the side insulating walls give small effects only.
Author (NSA)

N72-10770# Institute of Nuclear Research, Warsaw (Poland).
EFFECT OF GAS BOUNDARY LAYERS UPON THE ELECTRICAL PARAMETERS IN THE DC MHD GENERATOR [WPLYW PRZYSCIENNYCH WARSTW GAZU NA PARAMETRY ELEKTRYCZNE GENERATORA MHD PRADU STALEGO]
Z. Celinski 1971 210 p refs In POLISH; ENGLISH summary
(INR-1267) Avail: AEC Depository Libraries

The effect of the gas boundary layers on the electrical performance of the MHD generator with a constant area channel is studied. The electrical effects occurring in the electrode and insulating-wall boundary layers are analyzed and discussed. The conditions of the space-charge and circulating-current formation in the nonuniform gas are described. The appropriate mathematical expressions are derived and physically explained. A method using the electrical equivalent circuit is developed that makes it possible to calculate the electrical parameters of the MHD generator with two-dimensional gas flow. The leakage currents through the side insulating walls can also be taken into account by this method. The expressions of the terminal electrical parameters of the generator are derived, using some simplified assumptions.
Author (NSA)

N72-10771# Nihon Univ., Tokyo (Japan).
INSTABILITIES IN AN INHOMOGENEOUS PLASMA
M. Sato and Y. Terashima Oct. 1969 54 p refs
(JAERI-13758) Avail: AEC Depository Libraries

Instabilities in inhomogeneous plasmas are reviewed. The phenomena in collisionless plasmas are discussed. Both the cases for beta much less than m sub e/m sub i and 1 much greater than m sub e/m sub i are considered. As for stabilizing mechanisms, the effects of magnetic curvature are treated in detail. Finite-beta effects are also studied, and drift cyclotron instability is briefly discussed. Collisional instabilities are described by a kinetic model.
Author (NSA)

N72-10772# Nihon Univ., Tokyo (Japan).
PARTICLE LOSSES AND INSTABILITIES IN TOROIDAL SYSTEMS
M. Sato and Y. Terashima Oct. 1969 59 p refs
(JAERI-13759) Avail: AEC Depository Libraries

The case of nonaxial symmetric (Stellarator) field is treated. The particle trajectories are analyzed to show that the trapped particles make the banana motion, and the diffusion is obtained from the kinetic equation for the averaged motion of the bananas. A quasi-linear formulation for treating the nonstationary diffusion is also presented. The diffusion in an axially symmetric (Tokamak) field is also discussed. The effects of collisional processes and the static electric field are included in the discussions. The instabilities in an axially symmetric torus are described. The trapped-particle instabilities in a Tokamak-type field are treated, taking into account the static electric field and collisions. After presenting the theory of low frequency oscillations in general magnetic field configurations, the low frequency instabilities in a multipole field (without the toroidal component) are summarized.
Author (NSA)

N72-10773# United Kingdom Atomic Energy Authority, Culham (England). Translations Office.
POSSIBILITY OF SUPPRESSING SCREW MODES OF HYDROMAGNETIC INSTABILITY OF A PLASMA COLUMN CARRYING A CURRENT, BY MEANS OF A FEEDBACK SYSTEM
V. V. Arsenin Apr. 1971 6 p refs Transl. into ENGLISH from Atomnaya Energ. (Moscow), v. 28, 1970 p 141-142
(CTO-759) Avail: AEC Depository Libraries

The possibility of suppressing helical modes with the use of a system of feedbacks controlling the perturbation fields in the gap between the plasma and the casing, is considered. This possibility rests on the sensitivity of the large-scale oscillations to the boundary conditions outside the plasma. A theoretical model is described.
NSA

N72-10774# Princeton Univ., N.J. Inst. for Advanced Study.
NEOCLASSICAL EFFECTS ON PLASMA EQUILIBRIA AND ROTATION
M. N. Rosenbluth, P. H. Rutherford, J. B. Taylor, E. A. Frieman, and L. M. Kovrizhnikh 17 Jun. 1971 15 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17 Jun. 1971 Sponsored by AEC
(CN-28/C-12; Conf-710607-35) Avail: NTIS

In a toriodally confined plasma there are two possible senses of plasma rotation: i.e., about the major axis of the torus and about the magnetic axis. This latter rotation is strongly damped by ion parallel viscosity towards the lower collision frequency limit. In the lower collision frequency (banana and plateau) regimes, such rotations are shown to be damped by collisionless processes. Rotations about the major toroidal axis can be changed only by collisional diffusion of angular momentum across magnetic surfaces. This problem is formally equivalent to the calculation of higher-order (fourth order in gyro radius) diffusion with the radial electric field being chosen such as to eliminate the nonambipolar effects. This fourth-order calculation is feasible since the axisymmetry permits the diffusion to be expressed exactly by a set of moments of the collision operator with powers of the parallel velocity. These moments may then be evaluated by using approximate collision operators or, with the exact Fokker-Planck operator, by variational techniques.
Author (NSA)

N72-10775# Institut fuer Strahlenschutz, Stohl (West Germany).
EXPANSION OF A HIGH TEMPERATURE PLASMA IN VACUUM [EXPANSION EINES HOCHTEMPERATURPLASMAS IM VAKUUM]
K. D. Leuthaeuser and G. Locke Bonn Bundeswehramt 1971 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-71-10) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

The generation of high temperature plasma spheres by high altitude nuclear explosions is discussed. The expansion properties of these spheres are also discussed. A system of ordinary nonlinear differential equations is derived from the hydrodynamic equations by taking approprite averages over the fireball volume. The numerical solution comprises investigations of the time development of the fireball radius and the ratio of kinetic energy to irradiated thermal energy as a function of initial energy release and atomic weight of the plasma. The characteristic differences between pure fusion and fission plasmas are discussed. ESRO

N72-10776# Royal Inst. of Tech., Stockholm (Sweden). Div. of Electron Physics.

THE NEUTRAL ATOM DISTRIBUTION FUNCTION IN A LOW PRESSURE POSITIVE COLUMN (ELECTRIC DISCHARGES)

Staffan Torven Jul. 1971 28 p refs
(TRITA-EPP-71-17) Avail: NTIS

Effects of collisions are investigated in an arc column when all mean free paths for interaction between alike particles are much longer than the tube diameter. Inelastic electron-atom collisions are found to be the only significant process for the distribution function of the atoms. This is evaluated from a linear Boltzmann equation when ionizing collisions dominate. The velocity distribution is strongly modified when the ionization degree is increased and the neutral gas becomes rarefied. Author (ESRO)

N72-10777# State Univ. of New York at Buffalo. Faculty of Engineering and Applied Sciences.

DIAGNOSTICS ON STEADY STATE CROSS FLOW ARCHS. 2: INFLUENCE OF VELOCITY AND CURRENT Final Report

D. M. Benenson and A. A. Cenkner, Jr. Wright-Patterson AFB, Ohio ARL Feb. 1971 71 p refs
(Contract AF 33(615)-1797; Grants NSF GK-1174; FR-00126; NSF GP-7318; Project AF Proj. 7063)
(AD-727799; ARL-71-0020) Avail: NTIS CSCL 20/9

The influence of parametric variations of through-flow velocity and of arc current upon the local temperature distribution (and associated cross-sectional shape) of a steady-state, 1.1 atmosphere Argon cross-flow arc have been determined experimentally. Forced convection, at constant current, exerts profound influence upon the plasma. Isotherm distributions, obtained in a horizontal plane 4.94 mm above the anode (electrode spacing = 11.2 mm), indicate the pattern changes from that corresponding to the flow about a heated, blunt body (at low speeds) to that about a heated, highly streamlined body (at high speeds). The cross-section is noncircular, with major axis in the direction of flow. Author (GRA)

N72-10778# Aerospace Corp., El Segundo, Calif. Lab. Operations.

ANALYSIS OF THERMAL INDUCTION PLASMAS BETWEEN COAXIAL CYLINDERS Technical Report, May 1970 - May 1971

Hans U. Eckert 16 Jul. 1971 37 p refs
(Contract F04701-71-C-0172)
(AD-727760; TR-0172(2220-01)-4; SAMSO-TR-71-156) Avail: NTIS CSCL 20/9

A previously derived approximate solution of the one-dimensional energy balance equation for steady thermal induction plasmas is applied to the case of an annular plasma maintained between coaxial cylinders. It is assumed that heat conduction is the only loss mechanism and that both walls are at zero temperature. Charted material is presented that permits the determination of heat loads to either wall as well as the calculation of temperature distributions across the gap. Results for an atmospheric pressure argon discharge are compared with both exact numerical calculations and experimental data. Fair to good agreement is shown with the former; poor agreement is shown with the latter. The disagreement is shown to be caused by electron diffusion, which leads to overpopulation near the walls and suggests erroneously high temperatures when Saha equilibrium is assumed. The experimental temperature profiles are reproduced with excellent accuracy from a diffusion profile for the electrons that takes into account the nonuniformity of the induced electric field. Author (GRA)

N72-10779# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE CONNECTION OF ION CURRENT ON A SPHERICAL PROBE AND THE CONCENTRATION OF CHARGED PARTICLES IN A PLASMA

I. S. Niskonen and S. D. Vagner 29 Jan. 1971 9 p refs Transl. into ENGLISH from Kar.-Finsk. Ped. Inst. Petrozavodsk. Uch. Zap. (USSR), v. 20, 1967 p 99-103
(AF Proj. 4152)
(AD-727532; FTD-HT-23-2-71; UR/0000-67-020-000) Avail: NTIS CSCL 20/9

A numerical coefficient was experimentally determined for an expression which relates ion current through a negative spherical probe with plasma density. The measurements were conducted in He and Hg vapors. The plasma density was given for He. The values obtained for the numerical coefficient are given. Author (GRA)

N72-10780# Royal Inst. of Tech., Stockholm (Sweden). Div. of Plasma Physics.

GLOW AND ARC-TYPE PENNING DISCHARGES

N. Hopfgarten Jun. 1971 38 p refs
(TRITA-EPP-71-12) Avail: NTIS

Phenomena occurring in the discharge for modes of burning with low impedance are reviewed. Penning geometries are described and the discharge mechanism briefly treated. The composition of discharge current and its dependence on different parameters are discussed. Radial density and electron temperature distribution are presented. The charged particle velocity distribution is reviewed. The current transport across the magnetic field to the anode is dealt with. Oscillations occurring in Penning discharges are discussed. ESRO

N72-10781# Royal Inst. of Tech., Stockholm (Sweden). Div. of Plasma Physics and Fusion Research.

FUSION RESEARCH IN SWEDEN

B. Lehnert 7 Jun. 1971 29 p refs Presented at the IAEA Intern. Fusion Res. Council Meeting, Madison, Wis., 18 Jun. 1971 and Ann. Congr. of the Can. Assoc. of Physicists, Ottawa, 24 Jun. 1971
(TRITA-EPP-71-10) Avail: NTIS

A summary of research on fusion in Sweden is submitted. Specific problems of plasma generation, plasma balance, confinement, stability, plasma heating, and plasma diagnostics are discussed. Author (ESRO)

N72-10782# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME QUESTIONS OF THE EFFECTIVENESS OF THE PRODUCTION OF ELECTROENERGY IN MHD-GENERATOR IN A NONEQUILIBRIUM PLASMA

A. V. Gubarev, V. V. Breev, and V. A. Gurashvili Feb. 1971 88 p refs Transl. into ENGLISH of the book "Nekotorye Voprosy Effektivnosti Proizvodstva Elektroenergii v MGD-generatorakh na Neravnovesnoi Plazme" Moscow, 1968 p 1-66
(FTD Proj. 6040102)
(AD-724973; FTD-MT-24-253-70) Avail: NTIS CSCL 10/2

The work deals with efficiency of electric power production in magnetohydrodynamic generators, mainly on nonequilibrium plasma, in application to stationary high power plants. The authors prove that the future of such plants with a linear sectional conduction Faraday generator is very doubtful because with given field inductions, given reactor pressure and given gas temperature, which seem to represent the technological limits for

the next decade, efficiency of the power plant will not exceed 40 percent. Even with very optimistic assumptions, with a given reactor pressure, power plant efficiency of greater than 50 percent can be reached with a unit power of the magnetohydrodynamic generator of given amount. These low efficiency values of the power plant are due to the fact that the physical operating principle (plasma ionization, and others) of the generator under consideration and its electrogasdynamic circuit prevents achieving high efficiency of internal energy conversion in the channel.
GRA

N72-10783# Case Western Reserve Univ., Cleveland, Ohio.
PENETRATION OF A PLASMA BEAM IN A MAGNETIC BARRIER Final Report, 1 Jul. 1969 - 31 Jan. 1971
Osman K. Mawardi 19 Mar. 1971 13 p refs
(Contract F19628-69-C-0104; AF Proj. 8659)
(AD-724701; AFCRL-71-0200) Avail: NTIS CSCL 20/9

The report describes theoretical and experimental investigations on the penetration of a plasma beam in a magnetic barrier. The beam is produced by a coaxial plasma gun operated in the plasma focus mode. The magnetic barrier is produced by two large rectangular coils and has a steep gradient, whose characteristic length is smaller than a Larmor radius for the ions.
Author (GRA)

N72-10784# Avco Corp., Wilmington, Mass. Systems Div.
PROPAGATION OF ELECTROMAGNETIC WAVES IN A SIMPLIFIED NON-LINEAR GAS Interim Report
Ronald L. Fante 15 May 1971 25 p refs
(Contract F19628-69-C-0121; AF Proj. 4642-02-01)
(AD-725074; AVSD-0284-71-CR; AFCRL-71-0297; SR-8) Avail: NTIS CSCL 20/9

Solutions are obtained for the electromagnetic field propagating in a gas in which the electron density and electric field strength are interdependent. The solutions are specialized to study the reflection and transmission of electromagnetic waves by a non-linear gaseous slab. For a given slab thickness one finds that no matter how large one makes the incident power, the transmitted power cannot exceed finite limiting value, which can be calculated from theory.
Author (GRA)

N72-10785# Air Force Systems Command, Wright-Patterson AFB, Ohio. Avionics Lab.
BEHAVIOR OF GUARDED PROBES. PART 1: THE AFFILIATED FAMILIES OF PROBE CURVES. PART 2: THE SECOND DERIVATIVE CURVES
G. Medicus Apr. 1971 69 p ref
(AF Proj. 4152)
(AD-724721; AFAL-TR-71-101) Avail: NTIS CSCL 20/9

The behavior of probes with guard-electrodes GP-s is investigated experimentally. The results are described systematically by means of the probe-current profile spanning the voltage plane, with the coordinates V sub p identically equal to probe voltage and V sub G identically equal to guard voltage. Interpretation of the probe curves and their second derivatives is complicated because the fields between the plasma and the GP generally are more complex than those for the single probe. The advantages of GP-s for decreasing the secondary effects inherent in the unguarded probe in the vicinity of the space potential point and for finding this point are demonstrated. Generally speaking, the information provided by the parameter V sub G, available in addition to the V sub p of the unguarded probe, is discussed.
Author (GRA)

N72-10786 National Lending Library for Science and Technology, Boston Spa (England).
TECHNICAL USES OF PLASMA-BEAMS
Hans-Josef Patt 19 Aug. 1971 12 p refs Transl. into ENGLISH from VDI Z. (West Germany), v. 110, no. 16, 1968 p 665-670
(NLL-OA-Trans-1016-(6196.3)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Stationary plasma beams at high temperature and large enthalpydensity can be produced with the help of plasma burners. An electrical arc discharge is used to heat up the working gas, the choice of which is free, to a large extent. By adjusting the significant working parameters of the plasma burner, the characteristic qualities of the plasma flames can be varied over a wide range so as to provide at all times the best operating conditions for different uses. Plasma beams can always be inserted where a stationary spatially limited high temperature gas stream is required.
Author

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N72-10787# Atomic Weapons Research Establishment, Aldermaston (England).
MEASUREMENT OF THE ELASTIC MODULI OF BERYLLIUM BY AN ULTRASONIC RESONANCE TECHNIQUE
M. P. Baldwin Aug. 1970 16 p refs
(AWRE-O-49/70) Avail: AEC Depository Libraries; HMSO 14p; PHI $0.75

Specimens were prepared from polycrystalline beryllium subjected to various fabrication methods, and measurements were made of their elastic moduli over the temperature range 20 to 600 C. The results are discussed, and it is concluded that both temperature and fabrication method, with its associated texture, have a marked effect on the elastic moduli.
Author (NSA)

N72-10788# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
STUDY OF AGGLOMERATION OF POINT DEFECTS WITH AN ELECTRON MICROSCOPE Ph.D. Thesis - Grenoble Univ., 1970 [ETUDE PAR MICROSCOPIE ELECTRONIQUE DE L'AGGLOMERATION DES DEFAULTS PONCTUELS]
Alain Bourret Apr. 1971 68 p refs In FRENCH
(CEA-R-4144) Avail: AEC Depository Libraries

The nucleation and growth of agglomerated point defects produced by irradiation were studied in nickel and iron by electron microscopy. Investigations were made after neutron irradiation at 80 K, and after electron irradiation at room temperature (1 to 3 MeV). In neutron-irradiated nickel, the interstitials are clustered in Frank dislocation loops and the vacancies in small stacking-fault tetrahedra. Using a low-temperature stage on a conventional microscope, the annealing process of these defects was studied directly from 80 K to room temperature. The stage III annealing is attributed to the liberation of vacancy-type defects in aluminium and nickel. A nucleation theory based on chemical reaction rate theory is developed. Using a high-voltage electron microscope (up to 1.2 MeV), the threshold energy required to create these defects was measured in three different crystallographic directions.
Author (NSA)

N72-10789*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THERMODYNAMICS OF ROCK FORMING CRYSTALLINE SOLUTIONS
Surendra K. Saxena Oct. 1971 134 p refs
(NASA-TM-X-65745; X-644-71-436) Avail: NTIS CSCL 20L

Analysis of phase diagrams and cation distributions within crystalline solutions as means of obtaining thermodynamic data on rock forming crystalline solutions is discussed along with some aspects of partitioning of elements in coexisting phases. Crystalline solutions, components in a silicate mineral, and chemical potentials of these components were defined. Examples were given for calculating thermodynamic mixing functions in the

CaW04-SrW04, olivine-chloride solution, and orthopyroxene systems. Author

N72-10790# Iowa State Univ. of Science and Technology, Ames. Dept. of Physical Chemistry.
KNIGHT SHIFT AND SPIN LATTICE RELAXATION MEASUREMENTS IN THE PHOSPHIDES WITH THE Ti3P STRUCTURE TYPE AND THE VS(1 PLUS OR MINUS x) SYSTEM Ph.D. Thesis
Denis Michael Strachan Jun. 1971 57 p refs
(Contract W-7405-eng-82)
(IS-T-433) Avail: NTIS

Knight shifts for P-31 were measured for the compounds M3P (M = Ti, Zr, Hf, V, Nb and Ta) which have the Ti3P structure type. These shifts are small, temperature independent, and positive, ranging from 0.01% for Ti3P and V3P to 0.03% for Hf3P and Ta3P. Knight shifts for V-51 and Nb-93 in V3P and Nb3P also were measured and are 0.59% and 0.34% for vanadium and 0.9% for niobium. The method of tone-burst modulation was used to obtain the P-31 spin-lattice relaxation times. Short relaxation times were obtained and found to be inversely proportional to the absolute temperature. These results are suggestive of participation by phosphorus in the conduction process through the contribution of electronic configurations higher in energy than the ground state configuration. Author

N72-10791# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
NEW PRESENTATION METHODS FOR CARBOHYDRAZIDE AND UREA [NEUE DARSTELLUNGSMETHODEN FUER CARBOHYDRAZID UND BIHARNSTOFF]
W. Engel 31 Oct. 1970 31 p refs In GERMAN
(ICT-6/70) Avail: NTIS

Substances with a high gas evolution during combustion are sought for propellant applications. For this reason, the reaction of hydrazine with urea was investigated with and without the addition of transition metal oxides. After a suitable time the reaction proceeds to the formation of carbohydrazide. If nickel and cobalt catlysts are used, biurea is produced. ESRO

N72-10792# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SURFACE PROPERTIES OF SEMICONDUCTORS AND THE DYNAMICS OF IONIC CRYSTALS
V. N. Murzin 26 Jun. 1971 106 p refs Transl. into ENGLISH from Tr. Fiz. Inst., Akad. Nauk SSSR (Moscow), v. 48, 1969 p 145-203
(Contract F33657-71-D-0057; Proj. 7360)
(AD-727837; FTD-HC-23-100-71; UR/0254-69-048-000) Avail: NTIS CSCL 20/12

Absorption and reflectance spectra of crystalline Sr Ti O3, Ba Ti O3, and Ca Ti O3 in the IR spectral range were obtained on a long wavelength IR spectrometer. An analysis of the vibrational modes of compounds having the perovskite structure is given and its application to the experimental spectra is shown by using Cochran's dynamic theory of crystal lattices. At a temperature close to a phase transition, Ba Ti O3 showed a marked lowering of its spectral frequencies and an increase of oscillator strength of the lowest vibrational frequency. These observations were predicted by Ginzburg, Anderson, and Cochran and this article gives the first reported data which are in agreement with this prediction. Author

N72-10793# Stanford Univ., Calif. Center for Materials Research.
SYNTHESIS OF COMPOUND SEMICONDUCTING MATERIALS AND DEVICE APPLICATIONS Final Report, 1 Jul. 1970 - 30 Jun. 1971
D. A. Stevenson, R. H. Bube, R. S. Feigleson, G. S. Kino, B. L. Mattes, W. D. Nix, R. K. Route, and W. A. Tiller 30 Jun. 1971 73 p refs
(Contract DAHC15-70-G-12; ARPA Order 1644)
(AD-727803; SU-CMR-71-13) Avail: NTIS CSCL 20/12

Contents: Epitaxial growth; Applications of compound semiconductor materials; Relations between dislocations and mechanical properties and the production and characterization of defect structures in compound semiconductors. Annealing and precipitation studies in compound semiconductors; Interfacial phenomena at the solid-liquid interface in the Ga-As system-calculation of the solid-liquid interfacial energy in the Ga-aS system; Quasi-chemical contribution of the planar perfect interface. GRA

N72-10794# National Electrotechnical Inst., Turin (Italy).
EXPERIMENTS PROVIDING EVIDENCE AGAINST THE DOUBLE INJECTION MODEL FOR THE ELECTROLUMINESCENT PROCESS
Piero Brovetto, Gianluigi Busca, and Cesare Cortese Apr. 1971 22 p refs
(Grant EOOAR-0074-70; Project AF-9763-02)
(AD-727802; AFOSR-71-2108TR; SR-3) Avail: NTIS CSCL 20/12

Two experiments have been performed, concerning the interpretation of the EL process mechanism. The first deals with the behavior of the EL output at liquid helium temperature. The small decrement of the luminescence at 4.2K, demonstrates that the thermal regeneration of electron-hole pairs, invoked in the Fisher model, does not occur in practice. The second experiment, performed by striking the EL comets with an U.V. light spot, shows that a transport of carriers takes place from the comet head towards the tail. Even this experiment disagrees with the Fisher model. On the contrary, both the experiments well support an alternative EL model already proposed by the writers. Author (GRA)

N72-10795# Naval Research Lab., Washington, D.C.
PROCEEDINGS OF THE WORKSHOP ON NAVAL APPLICATIONS OF SUPERCONDUCTIVITY
John E. Cox and E. A. Edelsack 1 Jul. 1971 269 p refs Workshop held at Panama City, Florida, 4-6 Nov. 1970
(Projects PR002-02-42-5051; NRL-P05-02)
(AD-727573; NRL-7302) Avail: NTIS CSCL 20/3

Contents: Properties of superconductors; Superconducting materials-processing and properties; Cryogenic refrigerators; Superconducting electrical machinery; A survey of superconducting magnet technology; Submillimeter josephson effect devices; Magnetic field measurements using superconducting and conventional devices; Superconducting thin film mini-circuits; Superconducting systems for magnetic anomaly detection; Navy uses of cryogenic systems; Summary; Question session with invited speakers forming a panel; Superconductivity research supported by ONR; Superconductivity at NRL; NOL research in materials; NOL's interest in magnetometry; The interest in superconductivity at the naval undersea research and development center. GRA

N72-10796# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE OPTICAL PROPERTIES OF THIN SINGLE-CRYSTAL CdS FILMS IN A WIDE SPECTRAL INTERVAL
M. S. Brodin and M. I. Strashnikova 2 Jun. 1971 14 p refs Transl. into ENGLISH from the proc. of the Symp. of the Siberian Branch of the Institute of Phys. of Semiconductors, Electronic Processes of Single-Crystal Layers of Semiconductors (USSR), 1967 p 177-180
(AD-727544; FTD-MT-24-49-71; DIA-T69-04-9) Avail: NTIS CSCL 20/12

For reflection, absorption, and dispersion measurements, single-crystal CdS thin films of various thickness were used. The thickness of the particular thin film used was determined. Reflection curves were measured by the normal incidence of light on the crystal studied. For the measurements of the absorption and dispersion curves, photographic, photoelectric, and interference methods were used. The curves obtained are discussed in detail, and the measured values compared with calculated values. There is essentially no difference between the surface and the bulk layers of CdS crystals, insofar as the optical properties are concerned. The use of thin single-crystal films makes it possible to measure the spectral distribution of absorption and dispersion in a polarized light in a wide region beyond the absorption limit, corresponding to the excitation of the depth of the conduction band. Based on these data, certain conclusions can be made relative to the intensity and the polarization of structural absorption, which then makes this a convenient and useful method for the study of band structure of crystals. Author (GRA)

N72-10797# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE QUESTION OF CURRENT DISTRIBUTION IN COMBINED SUPERCONDUCTORS

V. V. Sychev and V. A. Alton 12 May 1971 20 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. i Transp. (Moscow), no 5, 1970 p 84-91
(Project 6040102)
(AD-727551; FTD-MT-24-92-71; UR/0281-70-000-005) Avail: NTIS CSCL 20/3

A complete and consistent picture of the current distribution in combined superconductors has been obtained. It is shown that the resistance of the superconductor itself can be directly commensurable with the resistance of the base layer material. Author (GRA)

N72-10798# Wisconsin Univ., Madison. Dept. of Statistics.

THE ATOM PROBE AND MARKOV CHAIN STATISTICS OF CLUSTERING

Jerome H. Klotz and Charles A. Johnson (Argonne Natl. Lab.) Apr. 1971 36 p refs Sponsored in part by AEC
(Grant NSF-GP-12093)
(PB-200569; UWIS-DS-71-267) Avail: NTIS CSCL 07D

The field ion microscope atom probe, used in the exploration of crystal structure, is discussed. Data is generated from a probe of an alloy of two types of metalic elements. A statistical model is formulated to investigate clustering of like atoms within the alloy. Physical considerations motivate a Markov chain generalization of the binomial model. A parameter in the model which measures the degree of clustering estimated by maximum likelihood and large sample distribution theory is given using results from Billingsly. A combinatorial analysis is developed which provides the exact distribution of the sufficient statistics and permits small sample comparisons of expectations and mean square errors of estimates with their large sample approximations. Author (GRA)

N72-10799# Case Western Reserve Univ., Cleveland, Ohio. Div. of Electrical Sciences and Applied Physics.

MAGNETISM AND ELECTRON STRUCTURE IN THE METALS Final Report, 1 May 1968 - 31 Oct. 1970

E. D. Thompson Jan. 1971 26 p refs
(Grant AF-AFOSR-1484-68; AF Proj. 9763)
(AD-725038; AFOSR-71-1144TR; Task-976303) Avail: NTIS CSCL 20/12

A technical summary of the research performed under AF-AFOSR-68-1484 is presented. Basic information on the material parameters important in determining dynamic magnetization processes in ferromagnetic films are given, and the relationship between energy bands and the spin wave dispersion in the 3d ferromagnetic elements is summarized. Author (GRA)

N72-10800# Technische Hochschule Stuttgart (West Germany). Inst. fuer Anorganische Chemie.

ELECTRICAL CONDUCTIVITES UP TO 1000 C IN THE Ge-As-Te SYSTEM Ph.D. Thesis [ELEKTRISCHE LEITFAEHIGKEITEN BIS 1000 C IM SYSTEM GE-AS-TE]

Peter Fischer 1970 136 p refs In GERMAN Sponsored jointly by Deut. Forsch. Gemeinschaft and Fonds der Chemie
Avail: NTIS

Electrical conductivity measurements up to 1000 C are reported on a number of ternary Ge-As-Te systems. It is shown that semiconducting in the melting stage is a necessary condition in forming chalcogenide glasses. Thermal instabilities and relatively small glassy areas are attributed to Te compound formations with mesomeric p6 bonding systems that provide high metallic conductivities at high temperatures. Annealing parameters affect the glass formation. Air cooling methods produce glasses in eutectic binary Ge-Te systems. Transl. by G.G.

N72-10801# Air Force Cambridge Research Labs., Bedford, Mass.

GROWTH AND CHARACTERIZATION OF TETRAGONAL (RUTILE) GeO_2 CRYSTALS

John W. Goodrum 12 Mar. 1971 31 p refs
(AF Proj. 5620)
(AD-725056; AFCRL-71-0187; Task-562009; AFCRL-PSRP-449) Avail: NTIS CSCL 20/2

The use of germanium in semiconductor devices continues in importance but adequate substrate materials and/or passivating (insulating) films for Ge are still lacking. Although such properties of the tetragonal oxide of germanium as chemical inertness and low electrical conductivity indicate it would be an excellent substrate/passivating material for Ge semiconductor devices, various attempts to prepare this oxide have met with only limited success (Albers, Valyocsik, and Mohan, 1966; Carasso and Faktor, 1965; Wilkes, 1964). This report describes a preparation method for this oxide as well as some previously unreported characteristics of the material. Author (GRA)

N72-10802# Manlabs, Inc., Cambridge, Mass.

PHYSICAL CHARACTERIZATION OF ELECTRONIC MATERIALS, DEVICES AND THIN FILMS

S. Kulin and Konstantin Kreder 1 Jan. 1971 45 p
(Contract F19628-70-C-0140; AF Proj. 5620)
(AD-725070; AFCRL-71-0204; SR-1) Avail: NTIS CSCL 20/12

In support of research being conducted by the Properties and Phenomena Branch, Solid State Science Laboratory, Air Force Cambridge Research Laboratory, ManLabs, Inc. is conducting a service effort that is directed toward the characterization of specified physical, chemical and structural properties of various materials. Experimental methods include chemical analysis, reflection electron microscopy and diffraction, X-ray diffraction and fluorescence analysis, light microscopy and electron microprobe analysis, in addition to the determination of specific properties, such as density, hardness and thermal conductivity. Special services, such as crystal orientation, cutting, grinding and polishing are also being performed. Specific materials submitted for characterization include spinel, lithium germanate, silicon, silicon carbide, quartz, ruby, magnesium oxide, copper chloride, gallium arsenide, boron, potassium tantalum niobate, yttrium-iron garnet, yttrium-aluminum garnet and lithium niobate. In addition, a variety of specimens have been submitted for specific studies such as phase identification, crystallinity and chemical analysis. Author (GRA)

N72-10803# Iowa Univ., Iowa City.

A THEORY OF VISCOPLASTICITY WITHOUT A YIELD SURFACE. PART 2: APPLICATION TO MECHANICAL BEHAVIOR OF METALS

K. C. Valanis Jan. 1971 32 p refs
(Grant AF-AFOSR-1916-70)
(AD-725026; AFOSR-71-1766TR-PT-2) Avail: NTIS CSCL 20/12

The endochronic theory of viscoplasticity developed previously by the author is used to give quantitative analytical predictions on the mechanical response of aluminum and copper under conditions of complex strain histories. One single constitutive equation describes with remarkable accuracy and ease of calculation diverse phenomena, such as cross-hardening, loading and unloading loops, and cyclic hardening as well as behavior in tension in the presence of a shearing stress, which have been observed experimentally by four different authors. Author (GRA)

N72-10804# Massachusetts Inst. of Tech., Cambridge. Solid State Research Group.
HIGH ELECTRIC FIELD TRANSPORT IN THE LEAD CHALCOGENIDES
Hugues St.Onge Apr. 1971 162 p refs
(Contract N00014-67-A-0204-0010; MIT Proj. DSR-70421)
(AD-725165; TR-8) Avail: NTIS CSCL 20/12

Nanosecond pulse techniques were used to measure the velocity-field characteristics of bulk samples of n-type PbSe, PbTe and Pb(.83)Sn(.17)Te at 77K and 4.2K for carrier concentrations ranging from 1 x 10 to the 17th power/cc to 5 x 10 to the 17th power/cc. At fields of a few hundred volts/cm, strong deviations from ohmic conduction are observed, the velocity showing a clear tendency towards saturation. The theoretical analysis of the results shows that at high electric fields polar optical scattering is dominant in the Pb salts. The results obtained for electric fields above the threshold for impact ionization are consistent with carrier generation if the Pinch effect is taken into account. Author (GRA)

N72-10805# GTE Labs., Inc., Bayside, N.Y.
JUNCTION GROWTH TECHNIQUES FOR GaAs AVALANCHE TRANSIT TIME DEVICES Semiannual Report, 1 Jul. - 31 Dec. 1970
James F. Black and Richard H. Deitch Apr. 1970 38 p refs
(Contract DAAB07-70-C-0320; DA Proj. 1H6-62705-A-056)
(AD-724705; TR-71-837.1; ECOM-0320-1) Avail: NTIS CSCL 20/2

New techniques of liquid phase epitaxial growth have been employed to prepare GaAs wafers with thin high quality n layers and p(-) layers. Wafers have been produced in p(-)-n-n(-) configurations; with abrupt p(-)-n and abrupt n-n(-) junctions; with p(-) layers 1 to 3 micrometers thick and doping levels as high as 2 x 10 to the 19th power/cc; with n layers of average thickness 3 micrometers, electron concentration in the range 1 to 4 x 10 to the 16th power/cc and mobility greater than 5000 sq cm/V.sec at room temperature. These epitaxial layers have been grown on n(-) substrate wafers with dislocation densities ranging from 500/sq cm to about 100/sq cm, electron concentrations in the range of 1 to 4 x 10 to the 18th power and electron mobilities ranging from 2500 sq cm/V.sec to 2000 sq cm/V.sec. The procedures and apparatus used for preparation of these epitaxial wafers are described in detail. In addition, the evaluation of these epitaxial wafers by techniques of capacitance-voltage profiling, infrared interference fringe measurement and X-ray anomalous diffraction contrast topography is described. Author (GRA)

N72-10806# California Univ., Berkeley. Lawrence Radiation Lab.
INORGANIC MATERIALS RESEARCH DIVISION Annual Report, 1970
Apr. 1971 254 p refs
(Contract W-7405-eng-48)
(UCRL-20500) Avail: NTIS

Various experiments are discussed for four different fields of inorganic matter; they include metallurgy, chemistry, ceramics, and solid state physics. The current progress of the inorganic research programs is reported, and literature surveys are also presented. J.A.M.

N72-10807 National Lending Library for Science and Technology, Boston Spa (England).
MEASUREMENT OF THE FILM THICKNESS OF METALLIC VAPOUR DEPOSITED FILMS
C. Knedlik 22 Sep. 1971 8 p Transl. into ENGLISH from Nachrichtentechnik (East Berlin), v. 20, no. 12, 1970 p 456-458 and 463
(NLL-PORS-Trans-2782-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The eddy current method for measuring film thickness of metallic vapor deposited films is examined. The measuring apparatus contains an electrically and geometrically formed search coil, which is set up in the receiver on the reverse side of the substrate which is to be layered. The measured results were observed directly at the substrate during the formation of the film by condensation. When the deposition parameters are stabilized, the reproducibility of definite thicknesses is better than 90%. E.M.C.

N72-10808 National Lending Library for Science and Technology, Boston Spa (England).
ELECTROPHYSICAL PROPERTIES OF Mo-Si SCHOTTKY BARRIERS
P. Schley and R. Sperling 19 Aug. 1971 3 p Transl. into ENGLISH from Nachrichtentech. Elektron. (Berlin), v. 20, no. 12, 1970 p 452-453
(NLL-PORS-Trans-2779-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The practical production of components with a blocking metal semiconductor junction is discussed. Special technological precautions to avoid the occurrence of contaminant layers between metal and semiconductor, which might affect the function of such components are presented. The effect of contaminant layers on carrier transport in the metal semiconductor junction can be ascertained by measuring the electrical properties of the junction. An installation with suitable measuring equipment was set up for the production of metal semiconductor junctions. The chemical deposition of molybdenum films on n-conducting epitaxial silicon in a pyrolysis process was chosen from the possible methods of producing metal semiconductor structures. The reasons for this choice were that interaction in the Mo-Si system only occurs at relatively high temperatures (700 C), that the use of vacuum equipment was to be avoided, and that this method seems suitable in principle for industrial production. Author

N72-10809 National Lending Library for Science and Technology, Boston Spa (England).
TEMPERATURE AND ORIENTATION DEPENDENCE OF DEFORMATION CHARACTERISTICS OF SINGLE CRYTALS
N. T. Travina and A. A. Nikitin 2 Sep. 1971 4 p refs Transl. into ENGLISH from Fiz. Metal. Metalloved. (Sverdlorsk), v. 30, no. 6, Dec. 1970 p 1291-1296 In RUSSIAN and ENGLISH
(NLL-TRANS-746-886-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The results of elongation tests of single Ni3Al crystals at different orientation, deformed within the temperature range of -196 to 600 C are given. A clearly expressed orientation dependence of the critical shear stress and coefficient of deformation hardening was observed. A considerable increase in these characteristics is observed for crystals with an orientation close to (100). The temperature dependence of critical shear stress and deformation hardening - their increase with an increase in temperature - is analogous to that observed earlier on polycrystalline and single Ni3Al crystals. The results obtained were investigated from the point of view of existing dislocation models of hardening of ordered alloys with a Ll2 structure. Author

N72-10810 Louisiana State Univ., Baton Rouge.
THE FERMI SURFACE OF ZINC, RADIO-FREQUENCY SIZE EFFECT Ph.D. Thesis
Oscar Lucien Steenhaut 1970 100 p
Avail: Univ. Microfilms Order No. 70-18560

The Fermi surface of zinc is determined from calipers obtained through RF size effect measurements. The 6- to 8-MHz RF measurements were performed at 1.2 K on high purity monocrystals of zinc approximately 0.5 mm in thickness. The Fermi surface was calipered using samples whose normals to the surfaces were parallel to one of the three principal symmetry

direction /0001/, /10(-1)0/, and /11(-2)0/, with magnetic field rotations in the plane of the sample. Calipers are assigned to definite orbits on the first- and second-band hole surfaces and the third-band electron surface. Calipers are given for the first-band hole surface and the spin orbit induced gaps between the first and second bands are discussed. The second-band hole surface is discussed in detail with the assignment of 30 series of calipers to definite orbits on this sheet of the Fermi surface.
Dissert. Abstr.

N72-10811 Stanford Univ., Calif.
NOISE EMISSION FROM INDIUM ANTIMONIDE Ph.D. Thesis
Arthur Howard Thompson 1970 78 p
Avail: Univ. Microfilms Order No. 70-18488

An explanation is presented for broadband, high frequency noise emission which is consistent with the experimental data previously reported. The explanation is based on the existence of localized high electric field regions that occur near discontinuities in the sample geometry or in the electrical properties. These high field regions cause local electron avalanche and the resulting electron hole plasma is the source of the noise emission.
Dissert. Abstr.

N72-10812 California Univ., Berkeley.
STRAIN HARDENING OF LONG-RANGE ORDERED SILVER-MAGNESIUM SINGLE CRYSTALS Ph.D. Thesis
Mohamed Osama Abo El-Fotoh 1969 72 p
Avail: Univ. Microfilms Order No. 70-17489

The deformation behavior of single crystals of AgMg intermetallic compound (CsCl type structure) of various orientations in the standard stereographic triangle was investigated in tension over the range from 20 to 300 K and in compression at 237.5 K. The plastic behavior shows asymmetry in both the critical resolved shear stress for slip on the /112/ planes and in the strain hardening.
Dissert. Abstr.

N72-10813 Louisiana State Univ., Baton Rouge.
CALCULATION OF ENERGY BANDS FOR NICKEL SULFIDE Ph.D. Thesis
John Miller Tyler 1970 87 p
Avail: Univ. Microfilms Order No. 70-18568

Energy bands are calculated for hexagonal NiS using lattice constants and crystal potential appropriate to the paramagnetic metallic phase. Group theoretic results for s, p and d bands in NiAs structure are obtained and the calculation is performed using a first principles, tight-binding method. The energy band structure is characterized by a 3d band about 3 volts wide hybridized with a broad s-p band, indicating s-d type conductivity. The Fermi energy lies just below the top of the d bands and the density of states exhibits a strong, sharp peak about one volt below the Fermi energy. Since the energy bands suggest that there will be considerable structure in the low energy region of the reflectivity, selection rules, polarizations, and energies for some of the spectra are presented. The band structure is discussed in terms of the metal-to-semiconductor transition which has been observed for hexagonal NiS.
Dissert. Abstr.

N72-10814 Stanford Univ., Calif.
ENERGY-LOSS MECHANISMS IN SEMICONDUCTOR RADIATION DETECTORS Ph.D. Thesis
Hans Rudolf Zulliger 1970 226 p
Avail: Univ. Microfilms Order No. 70-18513

The energy-loss mechanism due to ionization is investigated in lithium-drifted silicon and germanium semiconductor radiation detectors. A simple phenomenological model is presented which accounts for the energy losses in the formation of an electron-hole pair. Experiments were performed to measure the energy expended to produce a pair in silicon. Good agreement between theory and experiment was obtained for the absolute value of electron hole pair at room temperature and at 77 K in silicon. In germanium, the theoretical values were compared to the experimental results. After weighting the conduction band energies of the valleys in the <111> and <100> directions according to their respective density of states to obtain an effective ionization band-gap energy, good agreement between theory and experiment was also obtained in germanium.
Dissert. Abstr.

N72-10815 Louisiana State Univ., Baton Rouge.
ENERGY BANDS OF VANADIUM OXIDE Ph.D. Thesis
Thomas Ellis Norwood, III 1970 152 p
Avail: Univ. Microfilms Order No. 70-18551

Energy bands of vanadium oxide were calculated by the tight-binding method. The method of Lafon and Lin was extended to include 3p, 3d, and 4s functions, so that three-center integrals could be included in the calculations. All matrix elements were summed to convergence, and the core functions of both vanadium and oxygen were included explicitly. The crystal potential was constructed from a superposition of spherically-averaged atomic potentials. Band structures were calculated using three different crystal potentials. The density of states was computed from a sample of 505 points in 1/48 of the Brillouin zone. The effect of including core states was examined in detail, as were the effects of varying the factor lambda in the exchange potential. Using the three different band structures which were computed, an estimate of the self-consistent potential was made.
Dissert. Abstr.

N72-10816 Stanford Univ., Calif.
LUMINESCENCE, TRAPPING AND F CENTER IN LITHIUM FLUORIDE CRYSTALS Ph.D. Thesis
Lewis Donald Miller 1970 234 p
Avail: Univ. Microfilms Order No. 70-18449

The validity of previously proposed models was checked. The basic data needed for the formulation of a more comprehensive model are provided. The following experimental techniques were used: optical absorption in the visible and vacuum ultraviolet regions, irradiation with X-rays and ultraviolet light from a microwave discharge source, measurement of total luminescence output and luminescence emission spectra as a function of temperature, optical and thermal bleaching of absorption centers, and thermally stimulated luminescence. In addition to obtaining specific quantitative data on the parameters of the F center, hole traps, and luminescence centers in lithium fluoride crystals, information is also provided on the interactions between these imperfections. A model is proposed that is consistent with the results obtained. Alpha and beta absorption bands of lithium fluoride were tentatively identified.
Dissert. Abstr.

N72-10817 Rensselaer Polytechnic Inst., Troy, N.Y.
IMPURITY EFFECTS ON THE STRUCTURE AND PROPERTIES OF NON-CRYSTALLINE SELENIUM Ph.D. Thesis
William Carl LaCourse 1970 391 p
Avail: Univ. Microfilms Order No. 70-19941

The structure of glassy selenium was investigated using infrared spectroscopy. Other methods, including absorption edge measurements, electron spin resonance, and DTA were employed to a lesser degree. Effects of various impurities on the structure were also investigated, and an attempt was made to determine how impurities bond in selenium. The electrical conductivity was measured using impurity contents as the major variable. From results of this work, a mechanism for the conductivity of pure selenium can be postulated, and is based on the assumption of intermolecular barriers to hole motion. Using the results on oxygen impurities the intermolecular barrier is estimated to be .4 eV. The carrier concentration in pure selenium is postulated to be governed by acceptor levels with an ionization potential of .75 - 85 eV.
Dissert. Abstr.

N72-10818 Princeton Univ., N.J.
THEORETICAL BULK AND SURFACE PROPERTIES OF WURTZITE AND ZINCBLENDE STRUCTURES FROM AN IONIC BONDING STANDPOINT Ph.D. Thesis

Richard William Nosker 1970 308 p
Avail: Univ. Microfilms Order No. 70-19796

The importance of the long range electrostatic force in determining surface characteristics was assessed. Electrostatic potentials were calculated both in the bulk and at the principal surfaces of both wurtzite and zincblende. The nonpolar surfaces were assumed to be ideally terminated; for this case, it was found that the electrostatic potential reached the bulk value within three or four layers of the surface. The polar surfaces must be terminated in such a way that each surface has a monopole moment which cancels a bulk monopole moment built up from the contributions of many dipole moments due to double layers of charge throughout the crystal. The calculated electrostatic potentials were used to determine electrostatic surface energies for each of the arrangements considered on the low-index surfaces. It was found that the inherent simplicity of the electrostatic field in the point-ion approximation allows a fairly extensive determination of three dimensional lattice properties in cases where the crystal has a reasonable degree of ionicity. Dissert. Abstr.

N72-10819 Pennsylvania State Univ., University Park.
PRECISION MEASUREMENT OF THE ELASTIC CONSTANTS OF SOLIDS AND THEIR TEMPERATURE AND PRESSURE VARIATIONS Ph.D. Thesis
David L. Miller 1969 88 p
Avail: Univ. Microfilms Order No. 70-19439

Two methods of measuring elastic constants have been investigated. The phase comparison method was used to measure single crystal selenium at 25 C. The values obtained are given along with measurements of the slopes in the temperature range of 15 C to 35 C. The pulse superposition method was used for obtaining the elastic constants for selenium glass at 25 C, and the elastic constants for tellurium single crystal at room temperature. The pulse superposition method was modified by the addition of an automatic frequency control feature. This allowed high precision measurement of changes in acoustic wave delay time. A stability of + or - 2 parts in 10 to the 7th power during a 15 minute interval was obtained. Using a lithium fluoride sample, 12 temperature intervals of approximately 0.50 C were measured from 19.00 C to 25.01 C. Dissert. Abstr.

N72-10820 Utah Univ., Salt Lake City.
ELECTRO OPTICAL EFFECTS OF F SUB A CENTERS IN KCl:Li CRYSTALS Ph.D. Thesis
Franz E. Rosenberger 1970 103 p
Avail: Univ. Microfilms Order No. 70-19080

The effects of high electric fields on the optical absorption of F sub A centers in KCl : Li were measured for various geometrical configurations. The intrinsic lack of inversion symmetry of the center resulted in a displacement of the wavefunctions for ground and excited states. The corresponding dipole moment differences, causing a shift of the optical transition energy under applied field, were determined in size and sign. Further reduction of the center symmetry by the Li(+) occupying off-axis states, lead to low temperature effects from a redistribution of the Li(+) among the states by the applied field. The size and <110> orientation of the corresponding Li displacement dipole moment were obtained from an analysis of the data. The strong internal field from the Li(+) displacement dipole caused a mixing of the close lying 2s and 2p states. This resulted in an internal Stark effect of the optical transitions. Dissert. Abstr.

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N72-10821# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
THREE DIMENSIONAL GRAIN STRESS ANALYSIS USING THE FINITE ELEMENT METHOD Final Report
William A. Cook Edwards AFB, Calif. AFRPL Apr. 1971 60 p refs
(Contract F04611-70-C-0068)
(AD-725043; TWR-4558; AFRPL-TR-71-51) Avail: NTIS CSCL 19/1

The report presents the theory used in the finite element 3D Grain Stress Analysis Computer Program. In particular, there is a discussion of the nodal point grid generators that are a part of the computer program. Also, the type of elements used and the derivation of the equations used for the stiffness matrix calculation are discussed. An extrapolation technique for calculating strains and stresses at the boundary is presented, and the successful use of the computer program for analyzing a production motor is illustrated. Author (GRA)

N72-10822# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
CDC 6600 COMPUTER PROGRAM FOR THREE DIMENSIONAL GRAIN STRESS ANALYSIS Final Report, Jul. 1970 - Mar. 1971
Elwin C. Dickson Apr. 1971 82 p refs
(Contract F04611-70-C-0068)
(AD-725045; TRW-4557; AFRPL-TR-71-52) Avail: NTIS CSCL 19/1

The report describes a stress analysis computer program for non-homogeneous elastic solids in a three dimensional state of stress. The continuum can be enclosed in a membrane case. The displacement equations of equilibrium can be based on the usual potential energy variational principle, or they can be based on Herrmann's variational theorem for solids with high Poisson's ratio such as propellant grain. The HVT formulation assumes constant hydrostatic pressure over each double-dodecahedral element, and both formulations assume linear displacements over each of the 10 tetrahedral subelements. Problems involving a Poisson's ratio of 0.499 and having 10,560 displacement components have been run successfully on the CDC 6600 computer. Plane stress membrane is assumed for the case. The system of equations is solved by a direct elimination technique and the solution substituted back into the system to check the validity of the solution. Author (GRA)

N72-10823# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
SUPERCRITICAL COMBUSTION OF FUELS AND PROPELLANTS IN DROPLETS Final Report, 1 Apr. 1968 - 31 May 1969
Carlos Sanchez Tarifa, Antonio Crespo, Enrique Fraga, and Antonio Munoz 1 Apr. 1971 47 p refs
(Grant EOOAR-0027-68; AF Proj. 9711-01)
(AD-725749; AFOSR-71-1848TR) Avail: NTIS CSCL 21/2

The actual importance of the problem is discussed, and the theoretical and experimental evidence existing on the problem are briefly reviewed. A model for the theoretical study of the process is established assuming spherical symmetry, laminar conditions, and a zero thickness flame. Boundary conditions are thoroughly analyzed, showing that complete stationary theories cannot be applied. Further assumptions are introduced in order to solve the problem which leads to the study of two different models of the process, which differ, on the physical conditions assumed at the droplet surface. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N72-10824*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GAS TURBINE ENGINE FUEL CONTROL Patent Application
Harold C. Gold, inventor (to NASA) Filed 28 May 1971 29 p
(NASA-Case-LEW-11187-1; US-Patent-Appl-SN-147922) Avail: NTIS CSCL 21E

A variable-orifice system that is responsive to compressor inlet pressure and temperature, compressor discharge pressure, and rotational speed of a gas turbine engine is incorporated into a hydraulic circuit. The circuit includes a zero gradient pump driven at a speed proportional to the speed of the engine. The resulting system provides control of fuel rate for starting, steady running, acceleration, and deceleration under varying altitudes and flight speeds. NASA

N72-10825# Deutsche Forschungsanstalt fur Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Elektrische Antriebe und Energieversorgung
THE ELECTROSTATIC ION THRUSTER ESKA-18-P OF THE DFVLR BRUNSWICK [DAS ELEKTROSTATICHE IONENTRIEBWERK ESKA-18-P DER DFVLR BRAUNSCHWEIG]
Hans-Juergen Arlt, Siegried Baumgarth, Harro Bessling, Werner Kleinkauf, and Uwe Sprengel Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jun. 1971 53 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-71-26) Avail: NTIS; ZLDI Munich: 11,20 DM

Results of investigations carried out on the electrostatic ion thruster ESKA-18-p are presented. The thruster discharge characteristics as well as power conditioning and control are discussed. Separate measurements on a hollow cathode and a vaporizer are given, and beam diagnostics using Faraday probes are provided. The dependence of power input on the mass utilization factor is demonstrated and application of the thruster as a solar electric propulsion module of 2.5 kW is shown. ESRO

N72-10826# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A PRELIMINARY INVESTIGATION OF AN AIR-AUGMENTED ROCKET USING A ONE-DIMENSIONAL FLOW MODEL
D. J. Rickeard Jun. 1971 57 p refs
(AASU-306) Avail: NTIS

Performance estimates have been made for an air-augmented rocket system based on a small rocket of 2500 N thrust, using a one-dimensional inviscid flow analysis. Thrust augmentation of up to 47% of the rocket thrust is predicted for quite modest fuel/oxidizer ratios subject to complete mixing and burning of the fuel stream with the entrained air. Augmentation leads to a greater thrust enhancement at a freestream Mach number of 1.5 and 0.9. It has been found that there is an optimum value for the rocket exhaust Mach number, and that the secondary stream Mach number should be less than about 0.7 at entry to the secondary combustion chamber for optimum thrust. Thrust enhancement has been found to be conditional on careful design of the secondary duct, and the most successful configurations to involve increasing pressure along the walls of the secondary combustion chamber. Author (ESRO)

N72-10827# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
THERMODYNAMIC CONSIDERATIONS OF LIQUID RAMJET ROCKET PROPULSION SYSTEMS [THERMODYNAMISCHE UEBERLEGUNGEN AN FLUESSIGSTAUSTRAHL-RAKETENANTRIEBEN]
F. Volk 15 Aug. 1971 29 p refs In GERMAN
(ICT-2/71) Avail: NTIS

The chemical and technical possibilities of producing a high calorific cracking gas for energy supply to a ramjet engine in a combined propulsion system are discussed. The problems involved in partial combustion, and thermal and catalytic cracking of hydrocarbons are treated. It is shown that the method of partial combustion, as well as the pyrolytic cracking of hydrocarbons using hot rocket exhaust gases, is promising. ESRO

N72-10828# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmungsbereich Flugzeuge.
BASIC INVESTIGATIONS OF RECIRCULATION WITH CONFIGURATIONS CONSISTING OF 1 TO 6 JETS [GRUNDSATZUNTERSUCHUNGEN ZUR REZIRKULATION AN 1- BIS 6-STRAHLANORDNUNGEN]
F. Aulehla, W. Eder, and V. Zeidler Bonn Bundeswehramt 1971 60 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-71-12) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

Analyses of the fundamental factors were performed and model tests were carried out to determine the mechanism of recirculation in jet powered V/STOL aircraft and to devise methods for preventing or reducing the occurrence of thrust loss, engine surge and flame-out for differing engine configurations. Preliminary studies of the correlation between model measurements and full-size operation, and flow effects from forward, aft and the sides on a lift thrust configuration, are separated. ESRO

N72-10829# Northern Research and Engineering Corp., Cambridge, Mass.
COMPRESSOR SENSITIVITY TO TRANSIENT AND DISTORTED TRANSIENT FLOWS. VOLUME 2: MATHEMATICAL DETAILS AND COMPUTER PROGRAMS Final Report, 1 Jun. 1969 - Aug. 1970
Willem Jansen, Michael C. Swarden, and Albert W. Carlson Jan. 1971 184 p refs 2 Vol.
(Contract N00019-69-C-0602)
(AD-728024; NREC-1149-2-Vol-2) Avail: NTIS CSCL 21/5

The report is the second volume of a report describing the results of an analytical investigation of compressor sensitivity, conducted under Contract No. N00019-69-C-0602 for the Department of the Navy, Naval Air Systems Command. The objectives of the investigation were to develop an analytical model which simulates compressor response to spatial and temporal flow disturbances; to establish by application of the model the importance of various flow mechanisms, and their relationship to design variables, in determining compressor response; and to establish some design trends by means of a limited parametric study. This volume contains the detailed mathematical development of the models and the theoretical background of the equations that were utilized; the results of the studies are described in general terms in Volume 1.
Author (GRA)

N72-10830# Mitre Corp., McLean, Va.
A SURVEY OF PROPULSION SYSTEMS FOR LOW EMISSION URBAN VEHICLES
W. E. Fraize and R. K. Lay Sep. 1970 116 p refs Sponsored by DOT
(Contract F19628-68-C-0365)
(PB-200144; UMTA-TRD-52-70-2; M70-45) Avail: NTIS CSCL 13F

An overview is presented of low and negligible emission urban vehicle technology. Propulsion systems suitable for low emission urban vehicles are described. The state-of-the-art of low

emission systems is surveyed by direct contact with active development efforts in industry; the more promising areas for future development are reviewed. Exhaust emissions for fossil-fueled heat engines are summarized. A computer program was developed to demonstrate the effect of the various route cycle and vehicle parameters on required power and vehicle speed; results are presented for a typical small urban bus.
Author (GRA)

N72-10831*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERISTICS OF THE OPTICAL RADIATION FROM KAUFMAN THRUSTERS
Nelson L. Milder and James S. Sovey Washington Nov. 1971 35 p refs
(NASA-TN-D-6565; E-6469) Avail: NTIS CSCL 21H

The optical radiation from plasma discharges of electron-bombardment mercury-ion thrusters was investigated. Spectrographic measurements indicated that the discharge was composed primarily of mercury atoms and singly charged ions. Excitation spectra of doubly charged mercury ions was measured to obtain the fraction of such ions in the discharge. Accomplishments of spectroscopic measurements of a hollow cathode thruster included the identification of two diagnostic lines in the mercury spectrum and the interpretation of the spectral amplitudes in terms of a superposition of primary and Maxwellian electron distributions. Potential application of optical techniques to thruster control applications was also suggested by the measurements. Author

N72-10013# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Luftsaugende Antriebe.
INVESTIGATIONS OF EXHAUST JETS OF TL-ENGINE MODELS [UNTERSUCHUNGEN AN ABGASSTRAHLEN VON TL-TRIEBWERKSMODELLEN]
E. Schwantes *In* DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 33 p refs In GERMAN (See N72-10004 01-01)
Avail: NTIS HC $6.00/MF $0.95; ZLDI Munich: 54 DM

N72-10847*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
TOPS ATTITUDE PROPULSION SUBSYSTEM TECHNOLOGY
P. I. Moynihan *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 48-56 (See N72-10841 01-30)
Avail: NTIS CSCL 21C

N72-10848*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
LONG-DURATION FIRINGS OF A MARINER MARS 1969 CATALYTIC REACTOR
T. W. Price *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 57-66 refs (See N72-10841 01-30)
Avail: NTIS CSCL 21I

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N72-10832*# Stanford Univ., Calif. Dept. of Applied Mechanics.
DYNAMICS OF THE SOLAR WIND AND ITS INTERACTION WITH BODIES IN THE SOLAR SYSTEM Quarterly Progress Report, 1 Jul. - 3 Sep. 1971
John R. Spreiter 30 Sep. 1971 102 p refs
(Grant NGR-05-020-330)
(NASA-CR-123291; QPR-10) Avail: NTIS CSCL 03B

A discussion of the solar wind and its interaction with bodies of the solar system is presented. An overall unified account of the role of shock waves in the heating of the solar corona, the transmission of solar disturbances to the solar system, the flow fields of planets and natural satellites, and biological effects are provided. An analysis of magnetometer data from Explorer 33 and Vela 3A satellites to identify characteristics of solar wind shock waves is included. Author

N72-10833*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SOLAR ENVELOPE
L. F. Burlaga Oct. 1971 50 p refs Submitted for publication
(NASA-TM-X-65739; X-692-71-400) Avail: NTIS CSCL 03B

Processes which occur within the region between approximately 2 solar radii and 25 solar radii, which is called the solar envelope and the effect on the solar wind as seen at 1 AU are discussed. In the envelope the wind speed becomes supersonic and super-Alfvenic, the magnetic energy density is larger than the flow energy density, and the magnetic energy density is much larger than the thermal energy density. Large azimuthal gradients in the bulk speed are expected in the envelope, but the stream interactions near the outer edge of the envelope are probably relatively small. Cosmic ray observations suggest the presence of hydromagnetic waves in the envelope. The collisionless damping of such waves could heat protons out to approximately 25 solar radii and thereby cause an increase in V and T sub p consistent with the observed T sub p -V relation. A mechanism which couples protons and electrons would also heat and accelerate the wind. Alfven waves can accelerate the wind in the envelope without necessarily causing heating of protons; the Lorentz force might have a similar effect. Author

N72-10834*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCELERATION OF ELECTRONS IN SOLAR FLARES
Chung-Chieh Cheng Oct. 1971 7 p refs Submitted for publication Sponsored by NAS-NRC
(NASA-TM-X-65740; X-680-71-409) Avail: NTIS CSCL 03B

Acceleration of electrons by Langmuir plasma turbulence and by the Fermi mechanism are suggested to explain the two-stage acceleration processes observed in hard X-rays from solar flares. A model for particle acceleration in flares is presented. Author

N72-10835# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
ON THE MODULATION AND ENERGY SPECTRUM OF HIGHLY CHARGED COSMIC RAY NUCLEI
R. F. Cleghorn, Phyllis S. Freier, and C. J. Waddington Apr. 1971 24 p refs Submitted for publication
(Contract N00014-67-A-0113-0021)
(AD-727825; CR-156) Avail: NTIS CSCL 04/1

The intensity and energy spectrum of cosmic ray VH-nuclei (20 less than or equal to Z less than or equal to 30) has been measured in a stack of nuclear emulsions exposed over Fort Churchill in 1968. The integral intensity above 300 MeV/nucleon was 1.04 plus or minus 0.04 nuclei/sq. m.sr.sec. and three differential intensities were measured below 750 MeV/nucleon. Because of the current controversy regarding the true intensities of helium nuclei at this phase of the solar cycle the authors have also measured these nuclei, obtaining results intermediate between those quoted by other workers. Comparison of these results on the VH- and helium nuclei with those obtained in previous observations made at times of low solar modulation leads to the conclusion that there is no significant charge dependence in the modulation process. This conclusion is in conflict with an earlier analysis but depends on results of improved statistical weight and greater reliability for the VH nuclei and on the measurement of the helium nuclei in the same detector.
Author (GRA)

N72-10836# American Science and Engineering, Inc., Cambridge, Mass.
ANALYSIS OF SATELLITE DATA
Daniel R. Parsignault and Richard C. Chase 31 Mar. 1971 62 p refs
(Contract F19628-67-C-0277; AF Proj. 8600)
(AD-724903; ASE-2668; SR-4; AFCRL-71-0270) Avail: NTIS CSCL 04/1

Results of the analysis of some data obtained from the polar orbiting Air Force Satellites OV1-9 1966 - 111 A and OV1-13 1968 - 26 A are presented. The data analysis pertains to (1) electron data with E 0.94 MeV, in the outer radiation belt OV1-9, (2) electron data and proton data with 12 equal to or less than E equal to or less than 48 keV, in the outer radiation belts (OV1-13), and (3) low energy proton data with 0.08 less than E less than 5 MeV in the outer radiation belts (OV1-13).
Author

N72-10837# Houston Univ., Tex. Dept. of Physics.
A PROGRAM TO DETERMINE FUNDAMENTAL NUCLEAR DATA FROM MUON INTENSITY MEASUREMENTS AND TO HIGH ENERGIES: INITIAL RESULTS Final Scientific Report
William R. Sheldon May 1971 41 p refs
(Grant AF-AFOSR-1683-69; AF Proj. 9751-04)
(AD-724741; AFOSR-TR-71-1636) Avail: NTIS CSCL 04/1

A collaborative investigation of high-energy cosmic ray muons is described in terms of experiments in progress, the theoretical calculations which provided the motivation for the experimental work, and the ultimate goals of the research. An instrument which is being constructed for the measurement of spark chamber tracks is described and recent results from the Mont Blanc experiment are presented. One has determined from these results that the slope of the depth-intensity curve of underground muons is steeper at muon energies around 1000 BeV than is indicated by surveys of the published literature. From this experimental observation it is concluded that either muon dE/dx processes increase more rapidly with energy than is usually assumed, or the muon energy spectrum at ground level steepens around 1000 BeV. This latter possibility could be the result of an energy-dependent change in the slope of the primary cosmic ray spectrum, meson production processes, or the fundamental properties of the mesons. The X-process (direct muon production), which predicts a flatter spectrum, does not provide an explanation of the Mont Blanc observation.
Author (GRA)

N72-10838# Aerospace Corp., El Segundo, Calif.
NATURAL VARIATIONS IN THE GEOMAGNETICALLY TRAPPED ELECTRON POPULATION Technical Report, May 1967 - Jan. 1971
Alfred L. Vampola 15 May 1971 39 p refs
(Contract F04701-70-C-0059)
(AD-725034; TR-0059(6260-20)-17; SAMSO-TR-71-105) Avail: NTIS CSCL 04/1

Temporal variations in the trapped natural electron flux intensities and energy spectra are discussed and demonstrated using recent satellite data. These data are intended to aquaint the space systems engineer with the types of natural variations that may be encountered during a mission and to augment the models of the electron environment currently being used in space system design and orbit selection. These models, while excellent in some respects and quite satisfactory in most other respects, were generated before high resolution spectrometry data were generally available.
Author (GRA)

N72-10839# Air Force Cambridge Research Labs., Bedford, Mass.
POINTING ERROR CORRECTION FOR MILLIMETER WAVE SPECTROHELIOGRAMS
Michael J. Neary 8 Apr. 1971 27 p refs
(AF Proj. 8682)
(AD-725763; AFCRL-71-0236; AFCRL-PSRP-452; Task-868201) Avail: NTIS CSCL 03/2

The AFCRL 29-ft millimeter wave antenna at the Prospect Hill Millimeter Wave Observatory, Waltham, Massachusetts, is used to make solar maps (spectroheliograms), at a wavelength of 8.6 mm, for solar forecasting purposes. The half-power beamwidth of the antenna, although only 4 min of arc, is not narrow enough to detect the smaller hot regions that can develop into active centers on the sun. To overcome this limitation, a data-reduction process that can effectively narrow the beamwidth of the antenna, so that finer details on the maps will be visible, is needed. A computer program that can effectively narrow the beamwidth of the scanning antenna system by restoring and enhancing the antenna output has been applied to the Prospect Hill maps. It is believed that the enhanced maps can be further improved if a quiet sun component, or mean map, is subtracted from daily maps before the restoration is attempted. This report describes the technique used on the Prospect Hill IBM 1800 computer system to center the mean and daily maps on a common heliographic reference to effect the subtraction.
Author (GRA)

N72-10906# Sacramento Peak Observatory, Sunspot, N. Mex.
SOLAR INSTRUMENTATION, PART 1
John W. Evans *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 61-70 (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

N72-10907# Sacramento Peak Observatory, Sunspot, N. Mex.
SOLAR INSTRUMENTATION, PART 2
Richard B. Dunn *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 71-83 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

N72-10908# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
THE SOLAR CHROMOSPHERE AND THE GENERAL STRUCTURE OF A STELLAR ATMOSPHERE
Richard N. Thomas and Katherine B. Gebbie *In its* The Menzel Symp. on Solar Phys. Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 84-111 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

N72-10909# Hawaii Inst. of Geophysics, Honolulu.
THE CORONA
J. B. Zirker *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 112-126 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

N72-10910*# Harvard Coll. Observatory, Cambridge, Mass.
THE CHEMICAL COMPOSITION OF THE PHOTOSPHERE AND THE CORONA
George L. Withbroe *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 127-147 refs (See N72-10901 01-30)
(Contract NAS5-9274; Grant NGL-22-007-006)
(NASA-CR-122847) Avail: NTIS; SOD $1.75 Order No. C13.10:353 CSCL 03B

N72-10873*# Naval Research Lab., Washington, D.C.
EXPERIMENT S009: NUCLEAR EMULSION
F. W. ODell, M. M. Shapiro, R. Silberberg, B. Stiller, C. H. Tsao, N. Durgaprasad (NASA. Goddard Space Flight Center), C. E. Fichtel (NASA. Goddard Space Flight Center), D. E. Guss (NASA. Goddard Space Flight Center), and D. V. Reames (NASA. Goddard Space Flight Center) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 215-225 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 03B

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N72-10840# Oslo Univ. (Norway). Inst. of Theoretic Astrophysics.
ABSENCE OF DISCRETE ABSORPTION CLOUDS BELOW THE GALACTIC PLANE IN THE GALAXY CLUSTER AREA 0024 PLUS 1654
Rolf Stabell 1970 12 p refs
(NP-18866; Rept-29) Avail: AEC Depository Libraries

Spectra of 60 stars on objective prism plates taken with a Schmidt camera were measured. The plates cover the galaxy cluster area 0024 + 1654. Their colors and absolute magnitudes were calculated. The color excess as a function of distance modulus was determined and the galactic absorption in this area was found. The result agreed well with the value calculated from the cosecant law. No additional absorption due to discrete clouds below the galactic plane was found.
Author (NSA)

N72-10841*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
JPL QUARTERLY TECHNICAL REVIEW, VOLUME 1, NUMBER 3
Oct. 1971 249 p refs
(Contract NAS7-100)
(NASA-CR-122828) Avail: NTIS CSCL 22A

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14. A VIKING SATELLITE ORBIT TRIM STRATEGY G. R. Hintz p 133-142 refs (See N72-10852 01-31)

N72-10842*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
THE CHARACTERIZATION OF FACSIMILE CAMERA SYSTEMS FOR LUNAR AND PLANETARY SURFACE EXPLORATION c14
A. Eisenman *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 1-16 refs (See N72-10841 01-30)
Avail: NTIS CSCL 14E

Advantages of facsimile camera systems are reviewed for imagery of lunar and planetary surfaces from stationary or stopped remotely controlled vehicles. They include: better geometric fidelity than television systems, more picture elements per frame, ability to take single frame panoramic pictures, a very high contrast ratio within a picture, a choice of one or more narrow-band spectral responses over a wide possible range, image transmission over a low bit-rate communications channel without storage, very low power, small size, low weight, and ruggedizability to meet space flight requirements. Systems of this kind are under development for the 1975 Viking Martian lander, and have been used by the Soviets on Lunas and Lunokhod laboratory and field evaluation of a completed facsimile camera system is presented. The applicability of facsimile cameras to lunar and planetary rovers is demonstrated. Author

N72-10843*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Astrionics Div.
RELIABILITY ESTIMATION PROCEDURES AND CARE: THE COMPUTER-AIDED RELIABILITY ESTIMATION PROGRAM c15
F. P. Mathur *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 17-26 refs (See N72-10841 01-30)
Avail: NTIS CSCL 14D

Ultrareliable fault-tolerant onboard digital systems for spacecraft intended for long mission life exploration of the outer planets are under development. The design of systems involving self-repair and fault-tolerance leads to the companion problem of quantifying and evaluating the survival probability of the system for the mission under consideration and the constraints imposed upon the system. Methods have been developed to (1) model self-repair and fault-tolerant organizations; (2) compute survival probability, mean life, and many other reliability predictive functions with respect to various systems and mission parameters; (3) perform sensitivity analysis of the system with respect to mission parameters; and (4) quantitatively compare competitive fault-tolerant systems. Various measures of comparison are offered. To automate the procedures of reliability mathematical modeling and evaluation, the CARE (computer-aided reliability estimation) program was developed. CARE is an interactive program residing on the UNIVAC 1108 system, which makes the above calculations and facilitates report preparation by providing output in tabular form, graphical 2-dimensional plots, and 3-dimensional projections. The reliability estimation of fault-tolerant organization by means of the CARE program is described. Author

N72-10844*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Data Systems Div.
COMPUTER PROGRAM FOR THE AUTOMATED ATTENDANCE ACCOUNTING SYSTEM c08
P. Poulson and C. Rasmusson *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 27-32 (See N72-10841 01-30)
Avail: NTIS CSCL 09B

The automated attendance accounting system (AAAS) was developed under the auspices of the Space Technology Applications Program. The task is basically the adaptation of a small digital computer, coupled with specially developed pushbutton terminals located in school classrooms and offices for the purpose of taking daily attendance, maintaining complete attendance records, and producing partial and summary reports. Especially developed for high schools, the system is intended to relieve both teachers and office personnel from the time-consuming and dreary task of recording and analyzing the myriad classroom attendance data collected throughout the semester. In addition, since many school district budgets are related to student attendance, the increase in accounting accuracy is expected to augment district income. A major component of this system is the real-time AAAS software system, which is described. Author

N72-10845*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

ONSET OF SUPERCONDUCTIVITY IN SODIUM AND POTASSIUM INTERCALATED MOLYBDENUM DISULPHIDE c23

R. B. Somoano and A. Rembaum *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 33-37 refs (See N72-10841 01-30)

Avail: NTIS CSCL 20L

Molybdenum disulfide in the form of natural crystals or powder has been intercalated at -65 to -70 C with sodium and potassium using the liquid ammonia technique. All intercalated samples were found to show a superconducting transition. A plot of the percent of diamagnetic throw versus temperature indicates the possible existence of two phases in the potassium intercalated molybdenum disulfide. The onset of superconductivity in potassium and sodium intercalated molybdenite powder was found to be approximately 6.2 and approximately 4.5 K, respectively. The observed superconductivity is believed to be due to an increase in electron density as a result of intercalation. Author

N72-10846*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

LONG-TERM AGING OF ELASTOMERS: CHEMICAL STRESS RELAXATION OF FLUOROSILICONE RUBBER AND OTHER STUDIES c06

S. H. Kalfayan, A. A. Mazzeo, and R. H. Silver *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 38-47 refs (See N72-10841 01-30)

Avail: NTIS CSCL 07D

Aerospace applications of elastomers are considered, including: propellant binders, bladder materials for liquid propellant expulsion systems, and fuel tank sealants for high-speed aircraft. A comprehensive molecular theory for mechanical properties of these materials has been developed but has only been tested experimentally in cases where chemical degradation processes are excluded. Hence, a study is being conducted to ascertain the nature, extent, and rate of chemical changes that take place in some elastomers of interest. Chemical changes that may take place in the fluorosilicone elastomer, LS 420, which is regarded as a fuel and high-temperature-resistant rubber are investigated. The kinetic analysis of the chemical stress relaxation and gel permeation chromatography studies comprise the major portion of the report. Author

N72-10847*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

TOPS ATTITUDE PROPULSION SUBSYSTEM TECHNOLOGY c28

P. I. Moynihan *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 48-56 (See N72-10841 01-30)

Avail: NTIS CSCL 21C

The thermoelectric outer-planet spacecraft (TOPS) attitude propulsion subsystem effort is summarized. It includes the tradeoff rationale that went into the selection of anhydrous hydrazine as the propellant, and a brief description of three types of 0.445-N (100-mlbf) thrusters that were purchased for in-house evaluation. A discussion is also included of the 0.2224-N (50-mlbf)-developed thrusters and their integration with a portable, completely enclosed, propulsion module that was designed and developed to support the TOPS single-axis attitude control tests in the celestarium. Author

N72-10848*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

LONG-DURATION FIRINGS OF A MARINER MARS 1969 CATALYTIC REACTOR c28

T. W. Price *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 57-66 refs (See N72-10841 01-30)

Avail: NTIS CSCL 21I

Two long-duration tests were conducted with a surplus Mariner Mars 1969 monopropellant hydrazine reactor in an attempt to induce the washout phenomenon. The Mariner Mars 1969 reactor was chosen because it has a long development history and thus is well characterized. No washout occurred during either of the two 1000-s tests, although slow transients were observed in the reactor operation during what were nominally steady-state conditions. The 2000-s of operating time represents nearly an order of magnitude increase over the rated life of the engine. Author

N72-10849*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Project Engineering Div.

SIMULATION OF MARINER MARS 1971 SPACECRAFT c31

N. E. Ausman, Jr., N. K. Simon, and C. F. Rodriguez *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 67-78 (See N72-10841 01-30)

Avail: NTIS CSCL 22B

Preparation for the Mariner Mars 1971 mission is reported, including an extensive training program for operations personnel during which the primary source of spacecraft data was a computer program simulating the spacecraft. The objectives of a simulation model for training purposes differed from objectives appropriate to a design or analysis model. Model subsystems were designed to provide realistic telemetry data reflecting changes due both to commands and environmental parameters affecting the spacecraft at various times during the mission. The spacecraft is modeled along two separate functional lines. Boolean operations are concentrated in the spacecraft logic model, which determines the spacecraft state or mode, while mathematical operations or algorithms are executed in computational subsystem models. Although logic parameters are interrogated as a part of each computational pass, actual logic model processing occurs only when a change-of-state input is generated by the operations organization. The program design, some of the special characteristics of each of the modeled subsystems, and how the model was used in support of mission operations training are presented. Author

N72-10850*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.

MINICOMPUTER-CONTROLLED PROGRAMMED OSCILLATOR c07

R. Winkelstein *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 79-87 refs (See N72-10841 01-30)

Avail: NTIS CSCL 17B

Two programmed oscillators have been constructed, each using a low-cost minicomputer for the calculation and control functions, and each contained in a single rack of equipment. They are capable of operation in a phase-tracking mode as well as a frequency-tracking mode. When given an ephemeris suitable for the planet Venus, these units maintained phase coherence of better than 5 deg rms at 2388 MHz. Author

N72-10851*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.

A MULTIPLE-BEAM SPHERICAL REFLECTOR ANTENNA c07

R. Woo *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 88-96 refs (See N72-10841 01-30)

Avail: NTIS CSCL 17B

A spherical reflector with multiple feeds is considered for application in communications satellite systems. Data are presented which show that spherical reflectors possessing relatively high gain (40 db) and very small phase path error are feasible. A design of a spherical reflector utilizing corrugated horn feeds is considered. Radiation patterns are computed using the physical-optics technique. The designed antenna is approximately 60 lambda in diameter. Calculations performed for this antenna with three beams indicate that each beam has a gain of about 42 db, a beamwidth of 1.4 deg, and sidelobes that can be expected to be at least 28 db down. These results indicate that the feature of low sidelobes makes the spherical reflector a consideration for a multiple-beam communications satellite antenna. Author

N72-10852*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
MEASUREMENTS OF PLASMA PARAMETERS IN A SIMULATED THERMIONIC CONVERTER c22
K. Shimada *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 97-109 refs (See N72-10841 01-30)
Avail: NTIS CSCL 18K

Cesium-filled thermionic energy converters are examined as candidate electrical energy sources in spacecraft requiring tens to hundreds of kilowatts of electric power. The high operating temperatures necessary for a large specific power and high efficiency inevitably impose stringent constraints on the converter fabrication to achieve the desired reliability of the power system. The converter physics for reducing operating temperatures and cesium plasma losses are studied to achieve high reliability without sacrificing the power performance of the converters. Various cesium parameters which affect the converter performance are: (1) electron temperatures, (2) plasma ion densities, and (3) electric potential profiles. These were investigated using a Langmuir probe in a simulated converter. The parameters were measured in different cesium discharge modes. Author

N72-10853*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
HIGH-POWER MICROSTRIP RF SWITCH c09
S. D. Choi *In its* JAPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 110-124 refs (See N72-10841 01-30)
Avail: NTIS CSCL 09D

A microstrip-type single-pole double-throw (SPDT) switch whose RF and bias portions contain only a metallized alumina substrate and two PIN diodes has been developed. A technique developed to eliminate the dc blocking capacitors needed for biasing the diodes is described. These capacitors are extra components and could lower the reliability significantly. An SPDT switch fabricated on a 5.08 x 5.08 x 0.127-cm (2 x 2 x 0.050-in.) substrate has demonstrated an RF power-handling capability greater than 50 W at S-band. The insertion loss is less than 0.25 db and the input-to-off port isolation is greater than 36 db over a bandwidth larger than 30 MHz. The input voltage standing-wave ratio is lower than 1.07 over the same bandwidth. Theoretical development of the switch characteristics and experimental results, which are in good agreement with theory, are presented. Author

N72-10854*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.
DYNAMIC UPPER ATMOSPHERIC FORCE MODEL ON STABILIZED VEHICLES FOR A HIGH-PRECISION TRAJECTORY COMPUTER PROGRAM c13
A. R. Khatib *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 125-132 refs (See N72-10841 01-30)
Avail: NTIS CSCL 04A

The upper atmosphere model draws heavily on the behavior of the earth's upper atmosphere which exhibits cyclic as well as irregular variations in density profile, temperature, pressure, and composition in unison with solar activities as deduced from the more recent land-based and satellite observations. The lift and drag model is designed specifically for inertially stabilized vehicles of the Mariner class, with possible extension to gravity gradient stabilized vehicles of the GEOS class. The model considers operation in the free molecular flow regimes with large Knudsen numbers. The vehicle is considered a composite structure with basic components having well-defined shapes, each with its own surface characteristics in terms of temperature, reflectivity, and accommodation of free stream molecules. The model takes into account both the calculation of precise aerodynamic force coefficients in terms of expansion of modified Bessel functions in speed ratios and angle of attack, and approximate force coefficients when the speed ratios approach infinity. Other considerations include specular and diffused reflectivity, shielding, and shadow effects. Author

N72-10855*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.
A VIKING SATELLITE ORBIT TRIM STRATEGY c31
G. R. Hintz *In its* JPL Quar. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 133-142 refs (See N72-10841 01-30)
Avail: NTIS CSCL 22C

One strategy is submitted for meeting the varied and stringent requirements of the Viking Project on the control of the satellite orbit to obtain reconnaissance and to prepare for lander release. To satisfy these requirements, different orbit trim maneuver strategies were developed for two typical Viking missions. In addition, a summary of recent numerical results is included to show that this strategy satisfies the mission requirements which have been identified. Author

N72-10856*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE GEMINI PROGRAM: PHYSICAL SCIENCES EXPERIMENTS SUMMARY
Edward O. Zeitler, comp. and Thomas G. Rogers comp. (ITT Federal Electric Corp. Houston, Tex.) Sep. 1971 554 p refs (NASA-TM-X-58075) Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

Results and findings of physical sciences experiments performed in the Gemini program are presented. The summary contains descriptions of selected studies in the fields of astronomy, navigation, radiation, geophysics, meteorology, photography, and communications. For individual titles, see N72-10857 through N72-10891.

N72-10857*# Minnesota Univ., Minneapolis.
EXPERIMENT S001: ZODIACAL LIGHT PHOTOGRAPHY c14
E. P. Ney and W. F. Huch *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 3-16 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

Observations made during the Gemini 5, 9, and 10 missions in the context of their relation to ground-based and balloon-based experiments on dim-light phenomena are reported. Zodiacal light is the visible manifestation of dust grains in orbit around the sun. The negatives that were exposed on the Gemini 9 mission were studied by the use of an isodensitracer to produce intensity isophotes. Data on the following factors were obtained: (1) intensity distribution of the zodiacal light, both morning and evening; (2) the height and intensity of the airglow at various geographic positions; and (3) intensity distribution of the Milky Way in the region of the sky near Cygnus. Also, a previously unreported phenomenon was discovered. This phenomenon appeared as an upward extension of the normal 90-kilometer airglow layer. The extension was in the form of wisps or plumes approximately 5 deg wide and extending upward approximately 5 deg. The results obtained from pictures exposed on the Gemini 10 mission were of qualitative or geometrical value only. Author

N72-10858*# Naval Research Lab., Washington, D.C.
EXPERIMENT S011: AIRGLOW HORIZON PHOTOGRAPHY c14
M. J. Koomen, R. T. Seal, Jr., and J. Lintott (NASA. Manned Spacecraft Center, Houston, Tex.) *In* Nasa. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 17-36 refs (See N72-10856 01-30)

Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

The night airglow, which lies in a thin layer 70 to 100 kilometers above the earth, was studied. Although the surface brightness is low when observed through this layer from below, brightness of the airglow is augmented by a factor of approximately 35 when the airglow is viewed tangentially from the vantage point of the Gemini orbit. This augmentation phenomenon is an effective means of synoptic airglow study. The objective was to extend and refine the photographic method. The following techniques were used to achieve this goal: (1) The camera was equipped with a filter to photograph the two prominent line emissions at 5577 and 5893 A; (2) An illuminated camera sight and an aiming camera mount were used in an attempt to reduce the number of blurred photographs; (3) The number of photographs taken and the amount of the earth photographed were as large as possible; and (4) The photograph of the twilight horizon revealed a sunlit dayglow layer. Author

N72-10859*# Air Force Systems Command, Wright-Patterson AFB, Ohio. Air Force Avionics Lab.

EXPERIMENT D009: SIMPLE NAVIGATION c21

Robert M. Silva, Terry R. Jorris, and Eugene M. Vallerie, III (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 37-49 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

Space position-fixing techniques have been investigated by collecting data on the observable phenomena of space flight that could be used to solve the problem of autonomous navigation by the use of optical data and manual computations to calculate the position of a spacecraft. After completion of the developmental and test phases, the product of the experiment would be a manual-optical technique of orbital space navigation that could be used as a backup to onboard and ground-based spacecraft-navigation systems. Author

N72-10860*# Air Force Systems Command, Wright-Patterson AFB, Ohio.

EXPERIMENT D005: STAR OCCULTATION NAVIGATION c21

Robert M. Silva, Terry R. Jorris, and Eugene M. Vallerie, III (NASA. Manned Spacecraft Center, Houston, Tex.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 51-59 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

The usefulness of star occultation measurements for space navigation and the determination of a horizon density profile which could be used to update atmospheric models for horizon-based measurement systems were studied. The time of occultation of a known star by a celestial body, as seen by an orbiting observer, determines a cylinder of position, the axis of which is the line through the star and the body center, and the radius of which is equal to the occulting-body radius. The dimming percentage, with respect to the altitude of this grazing ray from the star to the observer, is a percentage altitude for occultation. That is, the star can be assumed to be occulted when it reaches a predetermined percentage of its unattenuated value. The procedure used was to measure this attenuation with respect to time to determine the usefulness of the measurements for autonomous space navigation. In this experiment, the crewmembers had to accomplish star acquisition, identification, calibration, and tracking. Instrumentation was required only for measurement of the relative intensity of the star as it set into the atmosphere. Author

N72-10861*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EXPERIMENT T002: MANUAL NAVIGATION SIGHTINGS c21

Donald Smith *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 61-69 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

Navigation-type measurements through the window of the stabilized Gemini 12 spacecraft by the use of a hand-held sextant are reported. The major objectives were as follows: (1) to evaluate the ability of the crewmen to make accurate navigational measurements by the use of simple instruments in an authentic space flight environment; (2) to evaluate the operational feasibility of the measurement techniques by the use of the pressure suit with the helmet off and with the helmet on and the visor closed; (3) to evaluate operational problems associated with the spacecraft environment; and (4) to validate ground based simulation techniques by comparison of the inflight results with base line data obtained by the pilot by the use of simulators and celestial targets from ground based observatories. Author

N72-10862*# Geological Survey, Flagstaff, Ariz.

EXPERIMENT S029: EARTH-MOON LIBRATION REGIONS PHOTOGRAPHY c14

Elliott C. Morris *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

Eleven photographs were taken of the L sub 4 earth-moon libration region during the Gemini 12 mission. The objective was to investigate the possible existence of clouds or particles of dust orbiting the earth in the L sub 4 region by the use of photographic techniques. No identifiable data were found in the first sequence of five photographs. Star field images could be recognized in two photographs of the second sequence of pictures. A light flare, of unknown source but possibly caused by light refraction from the window of the spacecraft, was recorded in both pictures. A reconstructed star field region (as photographed) is shown Isodensitraces of the two recognizable star fields were made; however, no conclusive results were obtained. Author

N72-10863*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

EXPERIMENT M412: LANDMARK CONTRAST MEASUREMENTS c14

Charles E. Manry *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 77-80 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

The objective was to measure the visual contrast of landmarks with the surroundings to determine the relative visibility of terrestrial landmarks from positions outside the atmosphere. Because of a malfunction of the photometer, no photometric data were obtained. A trial sighting run was performed in which a landmark on the western African coast was sighted, tracked through the nadir, and photographed. The telemetry record of the photograph was examined. Telemetry data were inconsistent with the known conditions of the landmark. Author

N72-10864*# Dearborn Observatory, Evanston, Ill.

EXPERIMENT S013: ULTRAVIOLET ASTRONOMICAL CAMERA c14

Karl G. Henize, Lloyd R. Wackerling, and Albert Boggess, III (NASA. Goddard, Houston, Tex.) *In* NASA. Goddard Space Flight Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 81-99 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

Recordings of the stellar ultraviolet radiation in the wavelength region from 2000 to 4000 angstroms are reported. An analysis of the surface temperatures of the stars, the absorption effects occurring in the atmospheres of the stars, and the absorption effects of the interstellar dust is made from the photographic data obtained. In addition to gathering basic astrophysical data about hot, young stars, the experiment is used to clarify the problems and techniques of uv photography of stars from manned spacecraft. Author

N72-10865*# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENT M411: TWO COLOR EARTH LIMB PHOTOGRAPHY c14
Max Petersen *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 101-114 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

Some simple calculations were made regarding the scattered light phenomenon of a sunlit earth limb. It was assumed that the light was to be scattered by an atmosphere irradiated by a zenith sun. Calculations were made with several different scattering coefficients assignable to various wavelengths of the extended visual region. The dependence of the excess blue-limb elevation was less obviously determined by the scattering angle than was suspected. It is reasonable to surmise that the variation of the values of excess blue-limb elevation originated principally from the red-limb variance, because the form of the blue-limb profiles (at least in their upper part) was more regular than was that of the red-limb profiles. Author

N72-10866*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M403: ELECTROSTATIC CHARGE c14
Patrick E. Lafferty *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 115-124 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20C

Experiment M403 was flown on the Gemini 4 and 5 spacecraft in an effort to discover whether the spacecraft could accumulate sufficient excess electric charge to constitute a hazard for later Gemini-Agena rendezvous missions. An attempt was made to measure the electric field terminating on a small area of the spacecraft retrograde adapter section and to calculate the total spacecraft charge from this measured field value. The Gemini 5 instrument was inhibited from responding to electric fields that corresponded to a charge on the spacecraft. However, readings were obtained on the Gemini 5 mission that were of as great or greater magnitude than those obtained on the Gemini 4 mission. This could be interpreted as an indication that the contribution of a net spacecraft charge to the Gemini 4 measurements was negligible. An operational measurement that was performed on a later rendezvous mission was indicative of a very small exchange of charge between the Gemini spacecraft and the Agena vehicle. Author

N72-10867*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M404: PROTON ELECTRON SPECTROMETER c24
James R. Marbach *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 125-139 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 18H

A series of experiments were performed during the Gemini 4 mission to acquire a detailed description of the radiation environment. Data from these experiments were used as source terms for the calculation of radiation doses received by the crewmembers. Comparison of theory with experimental data was accomplished by the use of dosimeters to monitor the integrated dose received by each crewmember. The instantaneous direction of the magnetic field of the earth relative to the spectrometer was used in the reduction of data because particle intensities were strongly directional with respect to the magnetic field. The simultaneous measurement of the external radiation environment and the radiation dose received by the crewmen during a mission was useful to evaluate and perfect calculational techniques. Author

N72-10868*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M408: BETA SPECTROMETER c24
James J. Marbach *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 141-152 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

The beta spectrometer functioned as planned throughout the Gemini 10 mission. The cool temperatures that were recorded from the instrument during the mission were indicative that the evaporative cooler, coupled with apparently lower-than-expected spacecraft-adapter temperatures, maintained ideal operating conditions. The data facilitate a good analysis of the electron directional distribution. The omnidirectional flux that was calculated is apparently consistent with previous measurements. Representative electron spectra, measured during the Gemini 12 mission, established the apparent decay of the artificially injected electrons (from the Starfish high altitude nuclear test) to such low levels that natural trapped electrons were becoming detectable. Author

N72-10869*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M405: TRI-AXIS FLUX GATE MAGNETOMETER c13
William D. Womack *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 153-168 ref (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 08M

A tri-axis flux-gate magnetometer was used on four Gemini spacecraft for determination of the magnitude and direction of the local geomagnetic field with respect to the spacecraft. Conclusions derived from the data are not only important to the proton-electron spectrometer experiment, but also are of significance to any directional charged particle experiments that may be conducted. Even though the Gemini spacecraft was not clean magnetically, the data could be reduced to a form that supplied directional information on the magnetic field in relation to the spacecraft. Stray fields were the result of spacecraft structure, not the result of current flows that were produced within the spacecraft electrical systems. Efforts were made to reduce spacecraft stray fields and to facilitate the acquisition of more accurate data. Author

N72-10870*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M409: BREMSSTRAHLUNG SPECTROMETER c24
Reed S. Lindsey, Jr. *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 169-184 ref (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

Spectrometric data were used to gain information for computation of the flux-energy spectra of bremsstrahlung inside the Gemini spacecraft and to determine if energetic electrons are able to penetrate the vehicle walls. The spectra were compared with computer predicted bremsstrahlung spectra by the use of data from beta spectrometers flown on Gemini 10 and 12 missions. The calculations of bremsstrahlung radiation involved uncertainties because of the small amount of information available on cross-section interaction and because of the complex, heterogeneous composition of the spacecraft. The bremsstrahlung detector was designed for time-differentiated measurement of the electron-induced gamma rays over a large section of the vehicle. Preliminary analysis of the data obtained during the missions was indicative that electrons did penetrate the spacecraft wall. Author

N72-10871*# Electro-Optical Systems, Inc., Pasadena, Calif.
EXPERIMENT S026: ION WAKE MEASUREMENT c24
David B. Medved and Ballard E. Troy, Jr. (NASA. Goddard Space Flight Center) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 185-198 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20H

Measurements of the ion-wake and electron-wake structure and other perturbations of the ambient medium produced by the Gemini spacecraft in orbit are reported. Thruster firings in the TDA-south configuration produced a decrease in the observed ion flux to the outboard ion sensor, an apparent increase in the ion flux to the inboard ion sensor, and an enhanced electron concentration to the outboard electron sensor. Visual inspection of strip-chart data was indicative that definitive wake-cone angles could be determined. It also was apparent for many cases that the electron distribution followed the ion depletion effects; this was indicative that the wake was a plasma, not an ion wake. Analysis of the data from the GATV orbits was indicative that electron and ion temperatures were higher than was estimated. The high electron temperature accounted for the sensor saturation observed during the mission. This temperature measurement was 0.3 electron volt at a 200-n. mi. altitude during daytime conditions. Spacecraft wake structure has been observed as far as 100 feet from the vehicle. Author

N72-10872*# Air Force Cambridge Research Labs., Bedford, Mass.
EXPERIMENT D010: ION SENSING ATTITUDE CONTROL c21
R. C Sagalyn and M. Smiddy *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 199-213 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

The feasibility of an attitude control system that uses environmental positive ions and an electrostatic detection system to measure spacecraft pitch and yaw is studied. The secondary objective was to measure the spatial and temporal variations of ambient positively charged particles along the orbital path of the Gemini 10 and 12 spacecrafts. The results proved that the use of a horizon detector in conjunction with pitch and yaw sensors would facilitate complete description of the spacecraft position and attitude. Furthermore, with the addition of a servosystem, the unit could be used as a complete automatic attitude-control system that would be applicable from the lowest satellite altitudes up to at least 10 earth radii. Also, results established that the charge density along the trajectory of the satellite could be determined by transmission of output voltages from the individual electrometers. Author

N72-10873*# Naval Research Lab., Washington, D.C.
EXPERIMENT S009: NUCLEAR EMULSION c29
F. W. ODell, M. M. Shapiro, R. Silberberg, B. Stiller, C. H. Tsao, N. Durgaprasad (NASA. Goddard Space Flight Center), C. E. Fichtel (NASA. Goddard Space Flight Center), D. E. Guss (NASA. Goddard Space Flight Center), and D. V. Reames (NASA. Goddard Space Flight Center) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 215-225 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 03B

The first exposure on a spacecraft of a nuclear emulsion apparatus designed to collect 1000 high quality tracks of heavy nuclei under a negligible thickness of matter (0.07 g/sq cm) is described. The cosmic ray detector consisted of a stack of nuclear emulsions that were designed to register at least 400 heavy nuclei tracks for each 10 hours of useful exposure. The spacecraft had to be oriented in a heads-up attitude during the 10-hour period to eliminate atmospheric albedo particles. The results are as follows: (1) a definite odd-even effect, with low abundances for elements of atomic number 7, 9, and 11; (2) a ratio O/C approximately 0.9; (3) Ne/C, Mg/C, and Si/C ratios between 0.2 and 0.3; (4) an abundance gap in the region 15 less than or equal to Z less than or equal to 19; and (5) a ratio (20 less than or equal to Z less than or equal to 28)/C 0.2, with a large concentration at Z = 26. These results are indicative that successful exposures of nuclear emulsions were obtained on the Gemini 11 mission. Author

N72-10874*# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EXPERIMENT D008: RADIATION IN THE SPACECRAFT c24
M. F. Schneider, J. F. Janni, and G. E. Radke *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 227-272 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 06R

The ionization and penetration power of various primary and secondary radiations that were present within the Gemini spacecraft was studied. This was accomplished by measurement of the contributions to dose according to profile, particle type, time, and position (location) within the spacecraft. Both active- and passive-dosimetry data collected in this experiment showed that no radiation hazard was associated with manned space operations within the Gemini spacecraft at altitudes as great as 310 kilometers in the South Atlantic anomaly region. This conclusion is warranted also by theoretical calculations. Author

N72-10875*# Air Force Cambridge Research Labs., Bedford, Mass.
EXPERIMENTS D004 AND D007: CELESTIAL RADIOMETRY AND SPACE OBJECT RADIOMETRY c24
J. Lovett *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 273-302 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 18H

Two interferometer spectrometers and a multichannel spectroradiometer were used as sensing instruments during the Gemini 5 and 7 missions. The selection of the instruments and of the particular detectors in the instruments was based upon the spectral bands to be investigated in each flight and upon the nature of the intended measurements. The instrument characteristics were a compromise among optimization for a particular type of measurement, a need for a broad selection of spectral information, and performance and other pertinent characteristics of the spacecraft. Data were collected on earth background, sky background, rocket exhaust plumes, celestial bodies, man made objects in space, weather phenomena, and spectral calibrations. Author

N72-10876*# Dudley Observatory, Albany, N.Y.
EXPERIMENT S010: AGENA MICROMETEORITE COLLECTION
Curtis L. Hemenway *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 303-312 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 03B

A study was made of the micrometeoroid content of the upper atmosphere and the near-earth space environment. Highly polished collection surfaces attached to the target docking adapter (TDA) were exposed to micrometeorite impact and debris collection during the Gemini 8, 9, and 10 missions. Also, the device was attached to the Gemini Agena target vehicle (GATV) during the Gemini 12 mission. The effects of space environment exposure on viable microorganisms were recorded. No substantive data regarding space environment micrometeorite content were derived from the Gemini 9 or 12 missions. However, some substantive data were obtained from the experiment package that was retrieved from the Gemini 10 mission. The micrometeorite-flux values obtained were in general agreement with values obtained from previous experiments by the use of other experimental equipment. The microorganisms that were retrieved from the Gemini 10 experiment package did not survive. However, the same kinds of specimens inside the package had good survival rates. Upon initial analysis, it appeared that the closed-cover shielding was a contributing factor in the protection and survival of the microorganisms. Author

N72-10877*# Dudley Observatory, Albany, N.Y.
EXPERIMENT S012: MICROMETEORITE COLLECTION
C. L. Hemenway, D. S. Hallgren, R. E. Coon, L. A. Bourdillon (New York State Dept. of Health), J. Hotchin (New York State Dept. of Health), and P. Lorenz (New York State Dept. of Health) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 313-336 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 03B

The micrometeorite activity in a near-earth environment and the effect of the environment on microorganisms were studied by exposure of polished metal and plastic surfaces to the environment outside the Gemini spacecraft. Preliminary results are summarized as follows: (1) The cumulative influx rate in the size ranges from 10 to the minus 15th power to 10 to the minus 14th power gram was approximately 2 particles/ sq m/sec, as determined on the Gemini 12 mission; (2) The cumulative influx rate in the same mass range, as determined by the data from the Gemini 9 mission was almost 200 particles/ sq m/sec; and (3) The large particle cumulative influx rate was about 3 x 0.00001 particle/ sq m/sec, with a mass of the order of 10 to the minus 7th power gram. No living organisms could be found on the sterile collecting surfaces after recovery and handling. Author

N72-10878*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENT S005: SYNOPTIC TERRAIN PHOTOGRAPHY c14
Paul D. Lowman, Jr. and Herbert A. Tiedemann *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 337-381 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

Several tentative conclusions can be derived from the results of the synoptic terrain photography experiment, with particular reference to the results from the Gemini mission. The photographs are additional confirmation of the feasibility and value of orbital photographs for geology, geography, and oceanography. The photographs have proven to be of value in the study of the tectonic problems. Although vertical or near-vertical photography is superior to oblique photography, photographs from the Gemini 12 mission have proven that low oblique photographs, and even high oblique photographs, may be of value for certain situations. The oblique views of the Makran Range were useful substitutes for vertical photographs. Equivalent aerial coverage by vertical photographs would have necessitated a camera altitude of several hundred miles. The oblique views of the Sierra Madre Oriental have been used in the search for structures that are approximately normal to the horizon and are enhanced by the foreshortening because of the photograph. Author

N72-10879*# Weather Bureau, Washington, D.C.
EXPERIMENT S006: SYNOPTIC WEATHER PHOTOGRAPHY c14
Kenneth M. Nagler and Stanley D. Soules *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 383-414 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

A data gathering effort on a number of cloud systems is reported. On both manned and unmanned Mercury and Gemini 3 missions, a number of good pictures of cloud systems were obtained. Also, specific experiments were performed by the crewmembers in the Mercury missions. Those experiments involved some of the spectral reflectance characteristics of clouds, land, and water regions of the earth surface as viewed from outside the atmosphere. Pictures obtained on successive revolutions of a Gemini spacecraft were indicative of the changes in and the movements of clouds at approximately 90-min intervals at certain points beneath the track of the spacecraft. A series of such views explain the various meteorological phenomena. Author

N72-10880*# Maryland Univ., College Park.
EXPERIMENT S007: CLOUD TOP SPECTROMETRY c20
F. Saiedy, D. Q. Wark (ESSA, Washington, D. C.), and W. A. Morgan (ESSA, Washington, D. C.) *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 415-426 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 04B

During the Gemini 5 mission, 26 spectrographic observations on various cloud types were obtained using the oxygen A band (7600 A). An example of the types of spectrum and photograph involved represents a cloud in the intertropical convergence zone. Densitometer traces of the spectra of three types of clouds (high, medium, and low) are shown. It was apparent qualitatively that radiation transmission in the oxygen band for a high cloud was much greater than that for a low cloud. The results proved the feasibility of cloud altitude measurements from a spacecraft by this method. Author

N72-10881*# Centre National de la Recherche Scientifique, Paris (France).
EXPERIMENT S051: DAYTIME SODIUM CLOUD c20
Jacques-Emile Blamont *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 427-430 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 04B

Daytime wind velocity measurements of the upper atmosphere as function of altitude were supposed to be gathered by Gemini 12 sequential photography of rocket made sodium clouds. Evaluation of the film was indicative that all 26 photographs were overexposed during the photographic sequences. The overexposures were caused by a camera shutter locked in the open position. Therefore, useful photographic data were not obtained for analysis. Author

N72-10882*# Naval Air Development Center, Johnsville, Pa.
EXPERIMENT D015: NIGHT IMAGE INTENSIFICATION c14
Thomas J. Shopple, George F. Eck, and Albert R. Prince *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 431-443 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

A performance test of a night image intensification system for use as a visual aid by the crewmen in Gemini is reported. The equipment package consisted of (1) image intensification camera; (2) camera control unit; (3) viewing monitor; (4) recording monitor and photographic recorder; and (5) monitor electronics and equipment control unit. Representative photographs are predominantly of lights and clouds. Photographs of three different sections of coastline reveal a contrast between the images of land and ocean. These images range in quality from good to poor. Author

N72-10883*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENT S030: DIM SKY PHOTOGRAPHY/ ORTHICON c14
Lawrence Dunkleman, Robert D. Mercer, Edward P. Ney (Minnesota Univ., Minneapolis), and Curtis L. Hemenway (Dudley Observatory) *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 445-454 refs (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

During Gemini missions, the image orthicon system was used to obtain photographic data on faint and diffuse astronomical phenomena. Results show that the photographs may be used to determine the airglow geometry. Although it was sensitive, the original photographic system was unsuitable for use in the study of dim and diffuse astronomical light sources. Author

N72-10884*# Air Force Systems Command, Wright-Patterson AFB, Ohio.
EXPERIMENTS D001, D002, AND D006: BASIC OBJECT, NEARBY OBJECT, AND SURFACE PHOTOGRAPHY c14
Harold E. Geltmacher *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 455-466 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

On the Gemini 5 mission, acquisition and tracking was performed by the use of celestial bodies as aiming points. However, distant photography of the REP was not possible because of spacecraft electrical power difficulties which occurred after REP ejection. Terrestrial photography was accomplished within the limitations imposed by weather conditions and spacecraft electrical and thruster problems. The photographs that were obtained were significant only as an element of the data to be used in technique evaluation. The other data were time-correlated position and pointing information, atmospheric conditions, sun angle, exposure settings, and the flight logs and verbal comments of the crewmembers. The photographs shown are representative of those that facilitated evaluation of the acquisition and tracking techniques that were used in these three experiments. Author

N72-10885*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M410: COLOR PATCH PHOTOGRAPHY c14
John R. Brinkmann and Robert L. Jones *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 467-470 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

A slate that supported four calibrated color targets was photographed during Gemini 10 mission extravehicular activity to determine if existing outdoor-type color films can reproduce colored objects accurately in the space environment. The experiment resulted in the acquisition of sufficient information to confirm that objects can be photographed in space with good color fidelity by the use of existing materials. Available color film is balanced to the solar spectrum in space, and the effect of ultraviolet energy on film degradation appears to be negligible. Author

N72-10886*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENT T001: ENTRY COMMUNICATION ON THE GEMINI 3 MISSION c07
Lyle C. Schroeder, Theo E. Sims, and William F. Cuddihy *In its* The Gemini Porgram: Phys. Sci. Expt. Sum. Sep. 1971 p 471-485 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 17B

Water addition to the Gemini 3 exhaust plasma was studied to determine its effectiveness in the establishment of communication links during the entry portion of the flight. Attenuation levels were measured with and without water injection at uhf frequencies of 230.4 and 296.8 megahertz and at the C-band frequency of 5690 megahertz. Ultrahigh frequency signals that had been blacked out were restored to significant levels, during early portions of the water-injection sequence, by the high flow rate injection. The C-band signal was enhanced by medium and high flow rate injections during the latter portion of the injection period. The uhf signal recovered during water injection resulted in an antenna pattern that was beamed in the radial direction of injection from the spacecraft. Postflight analysis showed that the uhf recovery data were consistent with injection-penetration theory. Author

N72-10887*# Naval Research Lab., Washington, D.C.
EXPERIMENT D014: ULTRAHIGH AND VERY HIGH FREQUENCY POLARIZATION c07
Robert E. Ellis *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 487-507 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20N

The measurement of inhomogeneitites in the electron content along the orbital paths of Gemini 8 and Gemini 9 missions was not accomplished because the tracking information was not available. The use of ultrahigh frequency radio transmission was the primary factor in the successful removal of a very high frequency Faraday rotation ambiguity; but, as was expected, this was not very useful for fine-scale polarization studies. Ionosonde data were useful in the computation of the slab thickness at the closest point of approach of the spacecraft. Author

N72-10888*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT M405, OPTICAL COMMUNICATIONS c16
Douglas S. Lilly *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 509-512 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 20E

An optical communications system, consisting of a gallium arsenide laser transmitter and three instrumented ground sites, was evaluated during the Gemini 7 flight. Considered was the use of crewmembers as a pointing element and the exploration of the atmosphere by optical coherent radiator outside the atmosphere. Results show that beacon lasers of greater survivability in field environments are needed to overcome unfavorable cloud conditions. A 1-watt argon laser is visible at orbital altitudes. G.G.

N72-10889*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT D016: POWER TOOL EVALUATION c15
Victor L. Ettredge *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 513-522 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 13I

Power tool evaluation was not attempted during the Gemini 11 mission because of the premature termination of the on-umbilical extravehicular activity (EVA). The experiment had been scheduled for the Gemini 8 mission, but early mission termination prevented completion of the experiment. However, the objective, equipment description, and experimental procedures are described briefly in this report. Author

N72-10890*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT D012: ASTRONAUT MANEUVERING UNIT
P. N. vanSchaik *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 523-554 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 05E

All astronaut maneuvering unit systems used during the Gemini 9 mission were in an acceptable condition for flight when the evaluation was terminated. Some difficulty was experienced with reception of the voice signal by the command pilot. All of the donning provisions are apparently practical in the orbital environment; however, the donning activities were more difficult to perform than had been experienced in the one-g and zero-g training exercises. Lighting was marginal because of the failure of one adapter floodlight and one penlight. The crewmembers reported a tendency for the extravehicular activity pilot and any loose equipment to move outward from the earth relative to the spacecraft. This tendency affected activities at a work station and maneuvering in an extravehicular environment. Author

N72-10891*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXPERIMENT D003: MASS DETERMINATION
Rudolph J. Hamborsky *In its* The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 555-559 (See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

The accuracy of a direct contact method with a spacecraft to determine the mass of an orbiting object was studied. The procedure involved acceleration of the Gemini Agena target vehicle by the use of the Gemini 9 spacecraft propulsion system. The target vehicle mass was calculated from the resultant acceleration, updated Gemini spacecraft mass, and calibrated thrust levels of the air-firing thrusters of the orbital attitude and maneuver system of the Gemini spacecraft. Author

N72-10892*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CORRELATIONS AMONG THE PARAMETERS OF THE SPHERICAL MODEL FOR ECLIPSING BINARIES
Stanley Sobieski and Julia E. White Oct. 1971 13 p refs Presented at the IAU Colloq. on Anal. Procedures for Eclipsing

Binary Light Curves, Philadelphia, 8-11 Sep. 1971 Submitted for publication
(NASA-TM-X-65746; X-672-71-437) Avail: NTIS CSCL 03A

Correlation coefficients were computed to investigate the parameters for describing the spherical model of an eclipsing binary system. Regions in parameter hyperspace were identified where strong correlations exist and, by implication, the solution determinacy is low. The results are presented in tabular form for a large number of system configurations. Author

N72-10893*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APOLLO GALACTIC X-RAY ASTRONOMY OBSERVATIONS
I. Adler, J. Trombka, R. Schmadebeck, P. Gorenstein (Am. Sci. and Eng.), and P. Bjorkholm (Am. Sci. and Eng.) Oct. 1971 11 p refs
(NASA-TM-X-65725; X-641-71-420) Avail: NTIS CSCL 03A

The galactic X-ray observations are a detailed study of the temporal behavior of pulsating X-ray sources. NASA's first X-ray astronomy satellite Uhuru (Explorer 42) has recently discovered fast time variability of pulsations in the output from several sources. The variability occurs on a time scale of minutes, seconds, or less, implying that the emitting regions are very small in size, much smaller than the sun, although they are emitting about a thousand times more power. Fast time variability may provide the clue that is needed to understand the mechanisms which drive pulsating sources. The Apollo observations record the emission from several objects continuously for a period of about an hour. The spacecraft can be pointed at the source for the entire time. On the other hand, Uhuru can observe only for about a minute or two per sighting. Consequently, Apollo has the capability for determining whether periodicities exist in the 10-1000 second range. Author

N72-10894*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONVECTIVE MOTION AND THE STRUCTURE OF THE JUPITER MAGNETOSPHERE
Kunitomo Sakurai Oct. 1971 22 p refs
(NASA-TM-X-65741; X-693-71-412) Avail: NTIS CSCL 03B

The convective motion and its relation to the electric field in the magnetosphere of Jupiter are investigated. It is shown that the electric field is induced in the Jovian ionosphere due to the corotating action of the ionospheric gases and further is communicated into the magnetosphere along the magnetic lines of force which connect between the ionosphere and the magnetosphere. This electric field drives the plasma to corotate with the planet in the magnetosphere. The distribution of the electric field and its effect on the plasma motion is estimated in the magnetosphere. The shape of the magnetosphere is then estimated considering the equilibrium condition. Discussion is given on the equilibrium plasma distribution in the magnetosphere and on the condition for the excitation of wave-particle interaction at the Io orbit. Author

N72-10895# Royal Aircraft Establishment, Farnborough (England).
APPLICATIONS AND RESULTS OF ORBIT DETERMINATION
R. H. Gooding Nov. 1970 24 p refs Presented at the ESRO Summer School on Spacecraft Operations, Gravenbruch, West Ger., Aug. 1970
(RAE-TM-SPACE-157) Avail: NTIS

The reasons for determining the orbits of earth satellites are summarized. It is described how knowledge of the earth's gravitational potential and its atmosphere has improved as a result of orbit determination. Author (ESRO)

N72-10896# Committee on Space Research (COSPAR), Paris (France).
FRENCH SPACE PROGRAM: REPORT TO COSPAR INTERNATIONAL COMMITTEE ON SPACE RESEARCH [PROGRAMME SPATIAL FRANCAIS]
1971 101 p refs In FRENCH Presented at the 14th COSPAR Meeting, Seattle, Jun. 1971
Avail: NTIS

Papers are presented on ionospheric and magnetospheric physics, aeronomy and meteorology, particle physics and cosmic rays, astrophysics and astronomy, trajectography and geodesy, and biology. ESRO

N72-10897# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ENGINEERING HANDBOOK OF SPACE TECHNOLOGY
A. A. Alatyrtsev 15 Jun. 1971 714 p refs Transl. into ENGLISH of the book "Inzhenernye Spravochnik po Kosmicheskoi Tekhnike" USSR, 1969 p 1-693
(AF PROJ. 4160)
(AD-727912; FTD-HC-23-456-70) Avail: NTIS HC $9.00/MF $0.95 CSCL 22/1

The handbook consists of three parts: the first, "Outer Space', consisting of six chapters, gives general astronomical information and basic data about the Sun, Earth, Moon, and their radiation and physical characteristics. It is introductory and contains data required for the succeeding chapters; the second part, "Mechanics of Space Flight', consists of sections and chapters dealing with insertion of space vehicles into orbit, orbital motion of space objects, perturbed motion and maneuvers, and motion about a center of mass. The material is given in 11 chapters in the form of formulas with a brief explanation of their use, design data, tables and graphs. Considerable emphasis is placed on the future questions of rendezvous of spacecraft, descent from orbit, and entry and landing on planets with and without an atmosphere; the third part, "Space Objects and Systems', is the largest in the volume and constitutes the basic handbook. This section deals with construction of spacecraft, materials, systems and elements of onboard safety equipment, systems for stabilization and orientation, thermal control, power supplies, and life-support equipment. Author (GRA)

N72-10898# Royal Greenwich Observatory, Herstmonceux (England).
A SPECTROSCOPIC SEARCH FOR SOUTHERN DELTA SCUTI STARS
D. H. P. Jones 1971 11 p refs *Its* Roy. Obs. Bull. No. 163 Prepared jointly with Roy. Obs. Cape Town
Avail: NTIS; Roy. Greenwich Obs., Herstmonceux, Engl.: £0.20

A Cassegrain spectrograph was used to investigate the radial velocities and short periodic variations of eight stars in the Scuti constellation. Two variables were found and their pulsational and other characteristics are compared with acknowledged delta Scuti variations. ESRO

N72-10899# Royal Greenwich Observatory, Herstmonceux (England).
THE STATISTICS OF THE NEARBY STARS
Richard L. Woolley, Susan B. Pocock, Elizabeth A. Epps, and Rosalind Flinn 1971 28 p refs *Its* Roy. Obs. Bull. No. 166 Prepared jointly with Roy. Obs. Cape Town
Avail: NTIS; Roy. Greenwich Obs. Herstmonceux, Engl.: £0.40

Data are analyzed of all the stars, known from their trigonometric parallaxes, to be within 25 parsecs of the sun with information on their colors, motions, and box orbit parameters. The luminosity function is calculated and it is suggested that the data imply an uneven rate of star formation in the sense that the number of stars formed recently (i.e. in the last 1.5 x 10 to the 8th power years) is greater than the average rate of star formation relating to stars now found close to the sun. It is found that 25 per cent of stars are visual doubles and that this percentage is independent of spectral type. However the proportion of spectroscopic binaries does appear to vary significantly from 25 per cent in A stars to about 10 per cent for late-type main-sequence stars. The method of calculation of the orbital invariants is described and a number of statistical analyses are made. It is shown that both low eccentricity and low box angle are characteristics of young stars. ESRO

N72-10900# Committee on Space Research (COSPAR), Paris (France).
FRENCH SPACE PROGRAM: REPORT TO COSPAR, INTERNATIONAL COMMITTEE ON SPACE RESEARCH [PROGRAMME SPATIAL FRANCAIS]
May 1970 128 p refs In FRENCH Presented at the 13th COSPAR Meeting, Leningrad, May 1970
Avail: NTIS

The processing of data gathered by the FR-1 satellite is examined and presented to the French Space Research Committee. Data include ionospheric and magnetospheric physics, aeronomy and meteorology, particle physics and cosmic rays, astrophysics and astronomy, trajectography and geodesy, and biology. ESRO

N72-10901# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
THE MENZEL SYMPOSIUM ON SOLAR PHYSICS, ATOMIC SPECTRA, AND GASEOUS NEBULAE
Katharine B. Gebbie, ed. Aug. 1971 214 p refs Symp. held at Cambridge, Mass., 8-9 Apr. 1971; sponsored in part by NSF (NBS-SP-353) Avail: SOD $1.75 Order No. C13.10:353

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N72-10902# Imperial Coll. of Science and Technology, London (England).
EXPERIMENTAL STUDIES OF ATOMIC SPECTRA AND TRANSITION PROBABILITIES c24
W. R. S. Garton *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 3-19 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

Results from laboratory astrophysical work toward systematic determination of atomic and molecular f-values and the associated problems of reliable diagnostic methods for the measurements of temperature and particle densities in plasmas are briefly outlined. Lifetime measurements on excited states by means of a new beam foil method yield f-values for many transitions in spectra of medium and very high stages of ionization. It is shown that double electron and/or inner shell excitations in all of the alkaline earth and alkali first spectra produce drastic affects on the shapes of the corresponding ionization continue somewhere in the ultraviolet. These spectra arise by transitions and yield a series of autoionization resonances, which converge on the metastable 2D levels of the corresponding ions. Measurements of the p-shell absorption spectra of the alkaline earth: Mg I through Ba I, are also reported. G.G.

N72-10903# Harvard Coll. Observatory, Cambridge, Mass.
TOWARDS AN ELEMENTARY THEORY OF THE PERIODIC TABLE c06
David Layzer *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 20-36 refs Sponsored by NSF (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

A variational screening method is used to calculate the behavior of wave functions and to describe the factors which determine cohesion and property variations for the well known regularities that characterize the periodic table of chemical elements. Predicted and observed ionization energies in the isoelectric sequences of boron, magnesium, titanium, argon, and calcium are graphically illustrated. G.G.

N72-10904# Virginia Univ., Charlottesville.
MANY-BODY CALCULATIONS OF ENERGIES AND TRANSITION PROBABILITIES c24
Hugh P. Kelly *In* Joint Inst. For Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 37-46 refs (See N72-10901 01-30)
(Contract F33615-69-C-1048)
Avail: SOD $1.75 Order No. C13.10:353

The many-body perturbation theory is used to calculate energies and transition probabilities from bound to continuum states in atomic structure analyses. Considered are the ground state multiplets of beryllium-3,4, carbon-6, oxygen-7, and iron-8. For Be, C, and O, the correlation energies are in excellent agreement with experiments. These methods are also used to calculate polarizabilities, shielding factors, and hyperfine constants. Preliminary results for oscillator strengths for bound-bound transitions in Be and Fe are included as well as photoionization cross section calculations on Fe in the ground state. The importance of ionization processes in astrophysics is stressed. G.G.

N72-10905*# Harvard Coll. Observatory, Cambridge, Mass.
RADIOACTIVE TRANSITIONS IN THE HELIUM ISOELECTRONIC SEQUENCE c24
Alexander Dalgarno *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 47-57 refs Sponsored in part by NASA and NSF (See N72-10901 01-30)
(NASA-CR-122846) Avail: NTIS; SOD $1.75 Order No. C13.10:353 CSCL 20H

The principles of the atomic spectrum theory are used to quantitatively analyze radiation transitions in two-electron helium-like atomic systems. Quantum theoretical methods, describing absorption and emission of a single photon in a radiative transition between two stationary states of an atomic system, reproduced the energy level diagram for the low lying states of helium. Reliable values are obtained from accurate variationally determined two-electron nonrelativistic wave functions for radiative transition probabilities of 2 3p states in the helium isoelectric sequence, and for the 2 1s and 2 3s1 states of the helium sequence. G.G.

N72-10906# Sacramento Peak Observatory, Sunspot, N. Mex.

SOLAR INSTRUMENTATION, PART 1 c29

John W. Evans *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 61-70 (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

The development of improved telescopes, spectrographs, magnetographs, and narrow band filters as the primary optical tools of solar astronomy is extrapolated. Efforts to improve optical observations by reducing the magnitude of the resolution elements and by expanding the observable intervals of lambda, t, x, and y for one or more of the Stokes parameters are outlined. G.G.

N72-10907# Sacramento Peak Observatory, Sunspot, N. Mex.

SOLAR INSTRUMENTATION, PART 2 c29

Richard B. Dunn *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 71-83 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

A few facets of the solar vacuum telescope are evaluated: (1) the thermal distortion of the window and mirrors; (2) the slit-jaw viewing system on the spectrograph, which represents a typical observing aid required by solar astronomers; and (3) photographs of the spicules at the limb and on the disk. Author

N72-10908# Joint Inst. for Lab. Astrophysics, Boulder, Colo.

THE SOLAR CHROMOSPHERE AND THE GENERAL STRUCTURE OF A STELLAR ATMOSPHERE c29

Richard N. Thomas and Katherine B. Gebbie *In its* The Menzel Symp. on Solar Phys. Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 84-111 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

Observations and ideas that have led to the rejection of each of the classical assumptions on the solar chromosphere are described and replacements for them are outlined. The character of the chromosphere is analyzed by including stellar atmospheric boundary effects in such a way that the structure produces chromospheric anomalies at large heights and approaches the classical model at great depths. The presence of the boundary introduces the following inhomogeneity effects: (1) radiative processes reflecting the boundary-induced asymmetry in the radiation field and the discrepancy between color and density referred to as dilution effect; (2) decreasing collision rates with decreasing density; (3) amplified aerodynamic motions with decreasing density that provide a nonradiative energy source; and (4) geometric inhomogeneities resulting from combined effects of aerodynamic motions and material instabilities associated with radiative effects. G.G.

N72-10909# Hawaii Inst. of Geophysics, Honolulu.

THE CORONA c29

J. B. Zirker *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 112-126 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

Recent trends in the study of the solar corona are reported. Progress in this field is a result of new observations (especially in the EUV and XUV) and of improved understanding of coronal atomic processes. Selected topics that illustrate current interests in the quiet corona are: the relation of coronal forms to the magnetic field, the physical state of the gas, and the mass (and energy) balance. Author

N72-10910*# Harvard Coll. Observatory, Cambridge, Mass.

THE CHEMICAL COMPOSITION OF THE PHOTOSPHERE AND THE CORONA c29

George L. Withbroe *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 127-147 refs (See N72-10901 01-30)
(Contract NAS5-9274; Grant NGL-22-007-006)
(NASA-CR-122847) Avail: NTIS; SOD $1.75 Order No. C13.10:353 CSCL 03B

Collected photospheric and coronal abundances are presented in tables as summarized from a variety of references. A fairly complete picture of the composition of the solar photosphere for the first 92 elements is developed. Photospheric and coronal abundances are equal to within a factor of 2 (0.3 dex). G.G.

N72-10911# Perkins Observatory, Delaware, Ohio.

OPTICAL LINE SPECTRUM

S. J. Czyzak and T. K. Krueger (AFSC, Wright-Patterson AFB, Ohio) *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 151-160 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No c13.10:353

An analysis is provided for the line intensity mechanism that produces the excitation of forbidden lines in ionized sulfur as they appear in many nebular filaments. Forbidden lines (magnetic dipole and electric quadrupole radiation) arise when electrons that have been collisionally excited to metastable levels of a configuration cascade to lower levels of the same configuration. The basic equations of statistical equilibrium for the five levels of (S II) are used to calculate wave functions and to formulate theoretical curves for the intensity ratio as order of magnitude. Results point out the necessity of accurate intensity ratios and atomic parameters for determining structure and ionization distribution. G.G.

N72-10912# California Univ., Los Angeles.

CHEMICAL COMPOSITION OF TYPICAL PLANETARY NEBULAE

Lawrence H. Aller *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 161-168 refs (See N72-10901 01-30)
(Grants NSF GP-23; NSF GP-460)
Avail: SOD $1.75 Order No. C13.10:353

The chemical composition of a gaseous nebula is determined from its bright-line spectrum by: (1) calculation of atomic parameters, notably the Einstein A values and the collision strengths; (2) measurements of line intensities and continuum data; and (3) allowance for the distribution of atoms of a given element among different ionization stages. Proposed is the construction of an approximation model for a nebula, in which the modification of the radiation fields by the nebular gases and of the consequent change of ionization with distance from the central star is accounted for by the proper transfer equation and where the equations of statistical equilibrium are solved throughout the nebular shell. At each point, then, the electron temperature and radiation field are obtained. G.G.

N72-10913# Harvard Coll. Observatory, Cambridge, Mass.

RADIO RECOMBINATION LINES

Leo Goldberg *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 169-181 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

Intensity measurements near the Balmer and Paschen limits in the spectra of several celestial objects are analyzed and departure coefficients for the H II regions are calculated from radio recombination lines. Radial velocities of the helium recombination lines indicate that they formed in the same region as the hydrogen lines and that their relative widths are a measure of electron temperature. Abundance ratios of ionized helium to ionized hydrogen derived from radio recombination lines in H II regions are given for Group I, II, and III sources in table form. Additional recombination lines of a higher atomic weight element observed in seven H II regions are tentatively identified as carbon. G.G.

N72-10914# Harvard Coll. Observatory, Cambridge, Mass.

INTERNAL MOTIONS AND KINEMATICS OF PLANETARY NEBULAE

William Liller *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 182-189 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

Various spectrographic and astronomical observations on internal motions and kinematics of planetary nebulae are compared and their results are briefly outlined. It is shown that momenta from collision processes provide the heavier elements with a velocity close to that of the surrounding atoms and ions and that different velocities of different ions therefore reflect the stratification of these ions within the nebula. Apparent angular motions of the nebular edge are caused by excitation and ionization fluctuations; this process depends on the temperature and luminosity of the exciting star, and the density and composition of the intervening gas. G.G.

N72-10915# Harvard Coll. Observatory, Cambridge, Mass.
FILAMENTARY STRUCTURE OF PLANETARY NEBULAE
Donald H. Menzel *In* Joint Inst. for Lab. Astrophys. The Menzel Symp. on Solar Phys., Atomic Spectra, and Gaseous Nebulae Aug. 1971 p 190-203 refs (See N72-10901 01-30)
Avail: SOD $1.75 Order No. C13.10:353

An elementary comet-shell model is formulated for the filamentary structure of planetary nebulae. The planetary model is composed of orbiting structures resembling comets whose tails are responsible for the filaments. The orbits are elliptical and the periods are of the order 4 million years. It is assumed that the shell originated long ago as condensations from nova ejecta. The structure is considered to be debris left over from the original contraction of a large mass of gas into a star. G.G.

N72-10916# Stanford Univ., Calif. Inst. for Plasma Research.
EXTRAGALACTIC RADIO SOURCES Final Report
David M. Mills 3 May 1971 84 p refs
(Contract N00014-67-A-0112-0006; Grant NSF GP-23840)
(AD-727145; SU-IPR-408) Avail: NTIS CSCL 03/2

Extragalactic radio sources are usually double, with the two components, or radio 'clouds', located at distances (s) up to several hundred kiloparsecs from the nucleus of the parent object (galaxy or quasar). These clouds are apparently generated in an explosive event occuring in or near to the nucleus, and then ejected in opposite directions. However, recent high-resolution observations lead to the conclusion that the ejection velocity is typically small (V less than or about 0.1 c) while the minimum internal pressure is quite high (equivalent to about .0001 gauss). In addition, the cloud size (w) is often quite small compared to the distance traveled (w/s about 0.05 - 0.30). The cloud must therefore be confined in some manner.
Author (GRA)

N72-10917# Stanford Univ., Calif. Inst. for Plasma Research.
ON THE POSSIBILITY OF PULSAR ACTION IN QUASARS Interim Report
P. A. Sturrock Apr. 1971 24 p refs
(Contracts F44620-69-C-0008; N00014-67-A-0112-0005; Grant NSF)
(AD-727793; SU-IPR-421; AFOSR-71-2147TR GP-23840; AF Proj. 9767-03) Avail: NTIS CSCL 03/2

A recently proposed theory of pulsars is taken as a basis for evaluating Morrison's proposal that quasars may be giant pulsars. Author (GRA)

N72-10918# California Inst. of Tech., Pasadena. Owens Valley Radio Observatory.
ACCURATE POSITION MEASUREMENTS IN THE 1720 MHz LINE OF OH
Ellen G. Hardebeck 1971 24 p refs
(Contract N00014-67-A-0094-0019)
(AD-726487; Rept-1971-8) Avail: NTIS CSCL 03/2

Positions accurate to plus or minus 10 secs were measured with the Owens Valley interferometer for seven sources in the 1720 MHz line of OH. These included three Class I sources (W3, W49, and W51) and four Class IIa sources (W28(A1), W44, ON-3, and GIII.5&0.8). ON-3 was found to lie close to component C of the complex radio source near NGC 6857, instead of near component A (the unusual nebula K3-50). The satellite line position coincided with a main line position for the Class I sources. Author (GRA)

N72-10919# California Inst. of Tech., Pasadena.
HIGH RESOLUTION OBSERVATIONS OF COMPACT RADIO SOURCES AT 6 AND 18 cm
K. I. Kellermann, D. L. Jauncey, M. H. Cohen, D. B. Shaffer, and B. G. Clark 1971 56 p refs
(Contract N00014-67-A-0094-0019)
(AD-726486; Rept-1971-6) Avail: NTIS CSCL 03/2

The small scale structure of extragalactic radio sources has been studied at 18 and 6 cm wavelengths using a tape recording interferometer. At the longest antenna spacing, 10,536 km, the baseline at 6 cm was 176 million wavelengths and the resolution was about 0.0004 arc seconds for the stronger sources. Many sources, including optically identified galaxies and quasars, are found to have several distinct components of widely differing size in the range from the few hundredths of a second of arc to the limit of our resolution. Many sources, including 0106+01, 3C 273, 3C 279, 1555+00, 2145+06, 3C 446, 3C 454.3, and 2345-16 all contain components which are unresolved on the longest baseline and are less than .0004 arc sec. in diameter. Observations at shorter wavelengths are required to resolve these sources. Because the maximum brightness temperature is limited to 10 to the 12th power K, by the inverse Compton scattering, baselines no greater than the diameter of the earth are probably adequate to resolve all of the stronger extragalactic sources. Author (GRA)

N72-10920# Little (Arthur D.), Inc., Cambridge, Mass.
PREDICTION AND ANALYSIS OF SOLAR ECLIPSE CIRCUMSTANCES Final Report
Wentworth Williams, Jr. 25 Mar. 1971 134 p refs
(Contract F19628-70-C-0087)
(AD-726626; ADL-71932-1; AFCRL-71-0049) Avail: NTIS CSCL 03/3

The report addresses the prediction and analysis of solar eclipse circumstances of interest to atmospheric, ionospheric and solar studies. In the first section specific algorithms for use in pre-eclipse planning and post-eclipse analysis are presented. In the second section, appendices, concerned with the calculation of solar and lunar ephemerides of requisite accuracy for prediction purposes, the calculation of ephemeris sidereal time, the prediction of the shadow outline on and above the earth, the calculation of local eclipse circumstances and the development of solar coordinate systems, provide the background for and the foundation of these algorithms. Author (GRA)

N72-10921# Emmanuel Coll., Boston, Mass. Physics Research Div.
ANALYSIS OF EXPERIMENTAL MEASUREMENTS ON FIELDS AND PARTICLES IN DEEP SPACE Final Report, 1 May 1966 - 30 Sep. 1970
M. Patricia Hagan 15 Feb. 1971 26 p
(Contract AF 19(628)-5970; AF Proj. 7601-07-01)
(AD-724729; AFCRL-71-0178) Avail: NTIS CSCL 22/2

Studies were made of planned satellite systems for probing particles in deep space, and programs were written to prepared for processing raw experimental data (such as range tapes) into data suitable for further analysis, where such processing had not already been done on data supplied for analysis. Author (GRA)

N72-10922# California Inst. of Tech., Pasadena. Owens Valley Radio Observatory.
DETECTION OF INTERSTELLAR OH IN TWO EXTERNAL GALAXIES, PART 3
L. Weliachew 1971 22 p refs
(Contract N00014-67-A-0094-0019)

(AD-724763; Rept-1971-3) Avail: NTIS CSCL 03/2

Molecular OH lines at 1665 and 1667 MHz have been detected in absorption in the spiral galaxy NGC 253 and the irregular galaxy M82. This is the first time interstellar molecular lines, whether radio or optical, have been observed outside the Galaxy. Observations were made with the Owens Valley interferometer, thus the amplitude and phase of the absorption features could both be measured. The run of phase versus velocity agrees with the sense of rotation of both galaxies. Abundances close to those found in the Galaxy are derived; however this comparison is not very meaningful because of possible differences in excitation conditions. Author (GRA)

N72-10923# California Inst. of Tech., Pasadena. Owens Valley Radio Observatory.
ON THE DISTANCE TO BL LACERTAE, PART 5
M. H. Cohen and J. C. Pigg 1971 10 p refs
(Contract N00014-67-A-0094-0019)
(AD-724764; Rept-1971-5) Avail: NTIS CSCL 03/2

The 21-cm absorption spectrum of BL Lac is consistant with its being extragalactic. Author (GRA)

N72-10924# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ADVANCED INTERDISCIPLINARY RESEARCH IN THE DEFENSE APPLICATIONS OF LABORATORY ASTROPHYSICS Semiannual Technical Status Report, Aug. 1970 - Jan. 1971
S. J. Smith Mar. 1971 30 p refs
(Contract DA-31-124-ARO(D)-139; AEPA Order 492)
(AD-725479; AROD-4445-188-P) Avail: NTIS CSCL 07/4

Contents: Plasma spectroscopy; Scattering and transport of resonance radiation; Radiation transfer; Plasma statistics; Ionization kinetic and reaction rates; Atomic collisions information analysis center; Electron energy losses and atomic interaction theory; Atomic interaction theory; Electron-atom collisions; Electron-ion recombination; Electron collisions with metastable atoms; Electron impact excitation of hydrogen; Electron-alkali atom scattering; Collisional relaxation mechanisms; Radiation processes; Electron excitation of metal atoms; Oscillator strengths and transition probabilities. GRA

N72-10925# Lockheed Missiles and Space Co., Palo Alto, Calif.
METHODS OF DESCRIBING COSMIC PLASMA. 3: NEAR-EARTH PLASMA
N. N. Klimov, I. A. Krinberg, and G. V. Popov [1971] 17 p refs Transl. into ENGLISH from Issled. Geomagn., Aeron. i Fizike Solntsa (USSR), no. 16, 1971 p 72-96
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Characteristic plasma parameters are given for different regions of near-earth cosmic space. These permit the classification of near-earth plasma according to a number of fundamental criteria and the estimation of the limits of applicability of various plasma equations. Author

N72-10926 Purdue Univ., Lafayette, Ind.
OPTIMUM SUCCESSIVE ORBITAL RENDEZVOUS Ph.D. Thesis
Jerry Eugene White 1970 203 p
Avail: Univ. Microfilms Order No. 70-18772

The problem of fuel-optimal transfer from a space station in a circular orbit to rendezvous with two vehicles in two different circular orbits in succession is considered. The rendezvous is to be accomplished in less than or equal to a fixed time which is less than the time required by a series of Hohmann transfers. The time of arrival at the first target vehicle is unspecified. Impulsive thrusting is used. The optimization technique employed is a combination of the conjugate gradient method with a Newton iteration to speed convergence near the minimum. This method was found to be less sensitive to initial choices of parameters than other methods. Using impulsive thrusting, analytic solutions of partial derivatives and the state along the entire trajectory are available. The optimization parameters are the components of impulsive velocity changes in two dimensions and the generalized eccentric anomaly which specifies the coasting arcs. The cost function is the magnitude of velocity change, with rendezvous constraints added as penalty functions. Dissert Abstr.

N72-10927* National Aeronautics and Space Administration, Washington, D.C.
MARS MAPPING: NEWS RELEASE
Richard T. Mittauer 4 Nov. 1971 7 p
(NASA-News-Release-71-225) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 03B

A brief account of the mission objectives for the Mariner 9 spaceprobe is presented. J.G.M.

N72-10928* National Aeronautics and Space Administration, Washington, D.C.
DISTRIBUTION OF APOLLO 15 LUNAR SAMPLES: NEWS RELEASE
Louise Dick 9 Nov. 1971 32 p
(NASA-News-Release-71-223) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20746 CSCL 03B

More than 2200 Apollo 15 samples and polished thin sections weighing a total of about three kilograms will be distributed to 201 principal investigators for study during the next year. The scientific investigations will provide detailed information on the samples' mineralogy, petrology, chemistry, age, and history and on the effects of micrometeorite impacts, solar radiation, and cosmic ray bombardment. Preliminary examination of samples show the Apollo 15 material to be of three types: dark colored iron-rich basalts associated with mare and rille formation; a few basalts enriched in feldspar collected near the Apennine front; and light colored fragmental rocks or breccias consisting of soil-like materials which were cemented together or of rock fragments which were welded together by partial remelting. Author

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N72-10929*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STATIC PRESSURE DISTRIBUTION ON CHRYSLER CORPORATION SPACE DIVISION SERV BOOSTER CONFIGURATION
E. A. Price, J. J. Hull, and E. A. Rawls Oct. 1971 793 p
(Contract NAS8-4016)
(NASA-CR-119993; DMS-DR-1125; NASA-P-1403; DRL-184-58) Avail: NTIS HC $9.00/MF $0.95 CSCL 22B

A dual purpose test was conducted in the propulsion wind tunnel (PWT) to evaluate the performance of an aerospike engine, in the presence of a booster, and obtain forebody and base pressure distributions on the booster in which it is installed. The test item was a 2.5 percent scaled replica of the SERV booster employing a 5 percent spike length aerospike engine installed in the base region of the model. Cold flow air was used to simulate engine jet operation. Two booster configurations were investigated, one on which reentry aerospike engine thermal protection doors were installed, and another where the doors were removed. The data presented are representative of the latter configuration for a Mach number range of 0 to 1.25 at angles of attack of 0 and 8 degrees and 0 degrees angle of sideslip. Author

N72-10930*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STABILITY AND CONTROL EFFECTIVENESS OF THE MDAC PARAMETRIC DELTA CANARD BOOSTER AT MACH 0.38. VOLUME 4: SURFACE EFFECTIVENESS, MODEL BUILDUP, AND DIRECTIONAL STABILITY AT HIGH ANGLES OF ATTACK
D. Bradley and R. Buchholtz Oct. 1971 481 p
(Contract NAS8-4016)
(NASA-CR-119998; DMS-DR-1139-Vol-4; NASA-S-1009-Vol-4; DRL-184-58-Vol-4) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

For Abstract See N72-10933

N72-10931*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STABILITY AND CONTROL EFFECTIVENESS OF THE MDAC PARAMETRIC DELTA CANARD BOOSTER AT MACH 0.38. VOLUME 3: WING PARAMETRIC VARIATIONS, INCIDENCE AND DIHEDRAL
D. Bradley and R. Buchholtz Oct. 1971 573 p
(Contract NAS8-4016)
(NASA-CR-119997; DMS-DR-1139-Vol-3; NASA-S-1009-Vol-3; DRL-184-58-Vol-3) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

For Abstract See N72-10933

N72-10932*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STATIC AERODYNAMIC CHARACTERISTICS AND CONTROL EFFECTIVENESS FOR MCDONNELL-DOUGLAS ORBITER CONFIGURATION FOR MACH NUMBER RANGE OF 0.4 TO 5.0
R. R. Ellis Sep. 1971 402 p
(Contract NAS8-4016)
(NASA-CR-120000; DMS-DR-1153; NASA-S-1026; DRL-184-58) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

An experimental aerodynamic wind tunnel investigation was conducted employing a 0.00325 scale model of the McDonnell-Douglas space shuttle orbiter configuration. This investigation was conducted in the NASA/Marshall Space Flight Center 14-by 14- inch trisonic wind tunnel. The investigation was to determine the aerodynamic characteristics of the orbiter over the Mach number range of 0.4 to 5.0, an angle of attack variation from -4 degrees to 50 degrees, and -6 degrees to 9 degrees angle of sideslip. Control surface effectiveness was investigated for elevator, aileron, and rudder deflections. Author

N72-10933*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STABILITY AND CONTROL EFFECTIVENESS OF THE MDAC PARAMETRIC DELTA CANARD BOOSTER AT MACH 0.38. VOLUME 1: CANARD PARAMETRIC VARIATIONS
D. Bradley and R. Buchholtz Oct. 1971 604 p
(Contract NAS8-4016)
(NASA-CR-119995; DMS-DR-1139-Vol-1; NASA-S-1009-Vol-1; DRL-184-58-Vol-1) Avail: NTIS HC $9.00/MF $0.95 CSCL 22B

A 0.015 scale model of a modified version of the MDAC space shuttle booster was tested in the Naval Ship Research and Development Center 7 x 10 foot transonic wind tunnel, to obtain force, static stability, and control effectiveness data. Data were obtained for a cruise Mach Number of 0.38, altitude of 10,000 ft, and Reynolds Number per foot of approximately 2 x one million. The model was tested through an angle of attack range of -4 deg to 15 deg at zero degree angle of sideslip, and at an angle of sideslip range of -6 deg to 6 deg at fixed angles of attack of 0 deg, 6 deg, and 15 deg. Other test variables were elevon deflections, canard deflections, aileron deflections, rudder deflections, wing dihedral angle, canard incidence angle, wing incidence angle, canard position, wing position, wing and canard control flap size and dorsal fin size. Author

N72-10934*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STABILITY AND CONTROL EFFECTIVENESS OF THE MDAC PARAMETRIC DELTA CANARD BOOSTER AT MACH 0.38. VOLUME 2: WING PARAMETRIC VARIATIONS, SIZE AND LOCATION
D. Bradley and R. Buchholtz Oct. 1971 862 p
(Contract NAS8-4016)
(NASA-CR-119996; DMS-DR-1139-Vol-2; NASA-S-1009-Vol-2; DRL-184-58-Vol-2) Avail: NTIS HC $9.00/MF $0.95 CSCL 22B

For Abstract See N72-10933

N72-10935*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: STATIC STABILITY AND CONTROL INVESTIGATION OF THE NR-GD/C DELTA WING BOOSTER (B-15B-1) AND A REUSABLE NUCLEAR STAGE (RNS) M = 0.6 - 4.96
E. C. Allen Sep. 1971 223 p
(Contract NAS8-4016)
(NASA-CR-120004; DMS-DR-1162; NASA-S-0249; DRL-184-58) Avail: NTIS CSCL 22B

Experimental aerodynamic investigations were made in the NASA/MSFC 14 x 14 inch trisonic wind tunnel on a NR-GD/C 0.0031 scale model delta wing booster (B-15B-1) and reusable nuclear stage (RNS). Three basic configurations were tested: (1) the B-15B-1 booster alone, (2) the RNS alone, and (3) the booster with the RNS mounted piggyback. Six component force and moment data were recorded for each of these configurations over an angle of attack range from -16 deg to 4 deg at zero degrees sideslip, and over an angle of sideslip range from -10 deg to 10 deg at zero and -6 degrees angle of attack. The configurations were tested over a Mach number range of 0.6 to 5.0 with a nominal Reynolds number of 6.5 million per foot except for Mach 1.2 and 3.0 where the Reynolds number were 12.4 million and 4.4 million per foot respectively. Author

N72-10936*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: EFFECT OF ORBITER/BOOSTER PROXIMITY INTERFERENCES ON THE AERODYNAMIC CHARACTERISTICS OF THE LAUNCH CONFIGURATION DURING SEPARATION OR ABORT MANEUVERS, M EQUALS 0.6 - 1.38
P. R. Romere and I. H. Fossler Jul. 1971 391 p
(Contract NAS8-4016)
(NASA-CR-119986; DMS-DR-1115; DRL-184-58) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

The transonic phase of the 0.0088105-scale MSC orbiter booster separation test was conducted in the LTV 4-foot high speed wind tunnel, at Mach numbers of 0.6,0.9, 1.1, and 1.38. The purpose of this test was to define the effects of the orbiter/booster proximity interference on the aerodynamic characteristics of the launch configuration during separation or abort maneuvers. Each model had both straight and delta wings available for variation of launch vehicle configuration concepts. Author

N72-10937*# Chrysler Corp., New Orleans, La.
SPACE SHUTTLE: EFFECT OF CONFIGURATION CHANGES ON THE DIRECTIONAL CHARACTERISTICS OF A GD/C BOOSTER MACH NO. 1.2 - 4.96
J. Brickey, T. Brice, and K. E. Marks Sep. 1971 366 p
(Contract NAS8-4016)
(NASA-CR-120001; DMS-DR-1155; NASA-S-0248; DRL-184-58) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

Force tests on a 0.0035-scale model of the General Dynamics/Convair aerospace space shuttle B-15B-1 booster were conducted in the MSFC trisonic wind tunnel. The configuration has a low delta wing, all-movable delta-planform canard controls, and a single vertical tail. The test was devoted to investigating the effects of various configuration variables upon lateral-directional characteristics. These variables included wing dihedral, rudder flare, and body flap deflection. Yaw runs were made at angles of attack of 6, 10, 15, 25, 30, and 35 degrees. The Mach number range for this test was 1.20 to 4.96. Author

N72-10938*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STUDY OF SPACE SHUTTLE ENVIRONMENTAL CONTROL

AND LIFE SUPPORT PROBLEMS Final Report
K. P. Dibble, F. E. Riley et al 11 Nov. 1971 194 p refs
(Contract NAS1-10478)
(NASA-CR-111978) Avail: NTIS CSCL 06K

Four problem areas were treated: (1) cargo module environmental control and life support systems; (2) space shuttle/space station interfaces; (3) thermal control considerations for payloads; and (4) feasibility of improving system reusability. Author

N72-10939*# North American Rockwell Corp., Downey, Calif. Space Div.
ESTABLISHMENT OF DESIGN CRITERIA FOR ACCEPTABLE FAILURE MODES AND FAIL SAFE CONSIDERATIONS FOR THE SPACE SHUTTLE STRUCTURAL SYSTEM Quarterly Progress Report, 15 Jun. - 15 Sep. 1971
R. W. Westrup 15 Sep. 1971 97 p refs
(Contract NAS8-27269)
(NASA-CR-121023; SD71-191-1; QPR-1) Avail: NTIS CSCL 22B

The application of general design approaches for preventing failures due to repeated load cycles is briefly discussed. Program objective, mission requirements, and structural design criteria are summarized. Discrete structural elements and associated sections were selected for detailed strength, fatigue, and fracture mechanics investigations. J.G.M.

N72-10940*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APOLLO 15 X-RAY FLUORESCENCE EXPERIMENT
I. Adler, J. Trombka, J. Gerard (Natl. Acad. of Sci., Washington, D. C.), R. Schmadebeck, P. Lowman, H. Blodgett, L. Yin, E. Eller, R. Lamothe, P. Gorenstein (Am. Sci. and Eng.) et al Oct. 1971 35 p refs Submitted for publication
(NASA-TM-X-65726; X-641-71-421) Avail: NTIS CSCL 22C

The X-ray fluorescence spectrometer, carried in the SIM bay of the command service module was employed principally for compositional mapping of the lunar surface while in lunar orbit, and secondarily, for X-ray astronomical observations during the trans-earth coast. The lunar surface measurements involved observations of the intensity and characteristics energy distribution of the secondary or fluorescent X-rays produced by the interaction of solar X-rays with the lunar surface. The astronomical observations consisted of relatively long periods of measurements of X-rays from pre-selected galactic sources such as Cyg-X-1 and Sco X-1 as well as from the galactic poles. Author

N72-10941*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: VERIFICATION OF BOOSTER TRANSITION CHARACTERISTICS FOR TRANSONIC AND SUPERSONIC MACH NUMBERS (M EQUALS 0.6 - 5.0)
W. V. Carter and R. F. McGinnis Sep. 1971 475 p
(Contract NAS8-4016)
(NASA-CR-119199; DMS-DR-1152; DRL-184-58; NASA-S-0223) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

The results of the booster verification wind tunnel test are presented. These tests were conducted in a 14 x 14-inch trisonic wind tunnel utilizing a .0035 scale model. The nominal Mach numbers tested were 0.6, 0.9, 0.95, 1.0, 1.05, 1.20, 1.50, 2.0, 2.74, 3.00, 4.50 and 5.0. The angle of attack range was +5 to 40 deg. The yaw data was obtained over a range of -10 to +10 deg at fixed angles of attack of 0, 6, 15, 25, and 30 deg. The Reynolds number range was 4.2 to 6.9 million per foot. Results include elevon and canard effectiveness in pitch, and rudder, aileron, body flap, and tail effectiveness in yaw. Author

N72-10942*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DEVELOPMENT OF CONTROL SYSTEMS FOR SPACE SHUTTLE VEHICLES. VOLUME 2: APPENDIXES
C. R. Stone, T. W. Chase, B. M. Kiziloz, and M. D. Ward Washington NASA Sep. 1971 341 p refs
(Contract NAS8-25181)
(NASA-CR-1900; HONEYWELL-14257-FR-Vol-2) Avail: NTIS CSCL 22B

A launch phase random normal wind model is presented for delta wing, two-stage, space shuttle control system studies. Equations, data, and simulations for conventional launch studies are given as well as pitch and lateral equations and data for covariance analyses of the launch phase of MSFC vehicle B. Lateral equations and data for North American 130G and 134D are also included along with a high-altitude abort simulation. J.M.

N72-10943*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SIMULATION STUDY OF EMERGENCY LUNAR ESCAPE TO ORBIT USING SEVERAL SIMPLIFIED MANUAL GUIDANCE AND CONTROL TECHNIQUES
David B. Middleton and George J. Hurt, Jr. Washington Oct. 1971 33 p refs
(NASA-TN-D-6488; L-7836) Avail: NTIS CSCL 22B

A fixed-base piloted simulator investigation has been made of the feasibility of using any of several manual guidance and control techniques for emergency lunar escape to orbit with very simplified, lightweight vehicle systems. The escape-to-orbit vehicles accommodate two men, but one man performs all of the guidance and control functions. Three basic attitude-control modes and four manually executed trajectory-guidance schemes were used successfully during approximately 125 simulated flights under a variety of conditions. These conditions included thrust misalinement, uneven propellant drain, and a vehicle moment-of-inertia range of 250 to 12,000 slugs per square foot. Two types of results are presented - orbit characteristics and pilot ratings of vehicle handling qualities. Author

N72-10944# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN QUESTIONS IN THE DESIGN OF SPACE VEHICLES WITH TRIAXIAL ORIENTATION
I. M. Lisovich and G. Yu. Maksimov 19 Apr. 1971 15 p Transl. into ENGLISH from Akad. Nauk SSSR, Inst. Kosmich. Issled. (Moscow), 1970 p 1-16
(AD-727547; FTD-HT-23-196-71; UR/0000-70-000-000) Avail: NTIS CSCL 22/2

In this report we examine space vehicles which use a flat solar battery as the basic electrical power generator and a narrow beam parabolic antenna to assure two-way high-density radio communication with ground points. GRA

N72-10945*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DEVELOPMENT OF CONTROL SYSTEMS FOR SPACE SHUTTLE VEHICLES, VOLUME 1
C. R. Stone, T. W. Chase, B. M. Kiziloz, E. D. Skelley, G. Stein, M. D. Ward, G. B. Skelton, E. E. Yore, J. G. Rupert, R. K. Phelps et al Washington NASA Oct. 1971 254 p refs
(Contract NAS8-25181)
(NASA-CR-1899; HONEYWELL-14257-FR-Vol-1) Avail: NTIS CSCL 22B

Control of winged two-stage space shuttle vehicles was investigated. Control requirements were determined and systems capable of meeting these requirements were synthesized. Control requirements unique to shuttles were identified. It is shown that these requirements can be satisfied by conventional control logics. Linear gain schedule controllers predominate. Actuator saturations require nonlinear compensation in some of the control systems. Author

N72-10849*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Project Engineering Div.
SIMULATION OF MARINER MARS 1971 SPACECRAFT
N. E. Ausman, Jr., N. K. Simon, and C. F. Rodriguez *In its* JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 67-78 (See

N72-10841 01-30)
Avail: NTIS CSCL 22B

N72-10855*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.
A VIKING SATELLITE ORBIT TRIM STRATEGY
G. R. Hintz *In its* JPL Quar. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 133-142 refs (See N72-10841 01-30)
Avail: NTIS CSCL 22C

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N72-10946# Houston Univ., Tex. Dept. of Mechanical Engineering.
THE VAPOR EXPLOSION-HEAT TRANSFER AND FRAGMENTATION. 3: PRESSURIZATION
K. H. Hsiao, J. E. Cox, P. G. Hedgcoxe, and L. C. Nitte Nov. 1970 36 p refs Presented at the Meeting of the Am. Nucl. Soc., Washington, 15 Nov. 1970
(Contract AT(40-1)-3936)
(ORO-3936-4; Conf-701102-20) Avail: NTIS

An approximate analysis is presented of the pressurization in a solidifying sphere of molten material immersed in an infinite cooling medium. The steady-state approximate method is applied to the heat conduction problem with change of phase (the Stefan problem). This solution provides the temperature distribution in the shell and rate of solidification, which can be employed in the evaluation of the pressurization stress and thermal stress distributions in the solid shell. Solidification is dependent both on Biot number and temperature difference between melting temperature of the molten material and the bulk temperature of the cooling medium. Pressurization inside the solid shell increases abruptly in the very early stages of solidification, and then quickly levels off, approaching a maximum value. Stress distributions are evaluated and plotted in dimensionless form. Additional results are presented for the specific case of aluminum alloy. Author

N72-10947# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS AND RESEARCH ON KINETICS OF THE FAILURE OF LAMINATED MATERIALS WITH A SMALL NUMBER OF LOADING CYCLES
V. M. Markochev and B. A. Rozdovskii 28 Jun. 1971 12 p refs Transl. into ENGLISH from the book "Prochnost Pri Malom Chisle Tsiklov Nagruzheniya" Moscow, Izd-vo Nauka, 1969 p 179-183
(Project FTD-60107)
(AD-727908; FTD-MT-24-46-71; UR/0000-69-000-000) Avail: NTIS CSCL 20/11

A procedure for automatic recording of the variation in crack length during rupture from repeated loads in investigated. From this procedure it is possible to present an analysis of the kinetics of crack development. GRA

N72-10948# Southampton Univ. (England).
THE EFFECT OF IN-PLANE STATIC STRESSES ON THE VIBRATION CHARACTERISTICS OF CURVED SANDWICH PLATES
K. M. Ahmed Jun. 1971 36 p refs Sponsored by Rohr Corp. of Calif.
(ISVR-TR-50) Avail: NTIS

In many applications, curved sandwich plates are subjected to initial membrane static stresses which have some effect on natural frequencies. In order to account for the presence of initial static in-plane stresses, the free vibration of doubly curved sandwich plates was investigated by the finite element method. The equations of motion were deduced by the variational method. It was concluded that the effect of initial static stresses on the lower natural frequencies was small and could be neglected, but for higher modes the effect was considerable. ESRO

N72-10949# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STABILITY OF EQUILIBRIUM OF A SHELL UNDER THE ACTION OF A FINITE SHORT LIVED PULSE
N. M. Grigoryants 19 Mar. 1971 32 p refs Transl. into ENGLISH from Stroit. Mekh. Raschet Sooruzhenii (Moscow), v. 6, 1966 p 31-35
(AD-727464; FTD-MT-24-82-71; DIA-T70-01-03; DIA-T70-02-01) Avail: NTIS CSCL 13/13

The dynamic stability of the equilibrium of an ideally smooth cylindrical cyclic shell under the action of an axial finite short-lived pulse is investigated with a simultaneous account of forces of inertia of both radial surfaces and in the middle surface of the shell. For a freely supported shell the system of two nonlinear differential equations, the approximate solution of which allowed establishing values of the critical pulse of steady amplitudes in the zone of the main parameter resonance, is obtained. Author (GRA)

N72-10950# Aeronautical Research Associates of Princeton, Inc., N.J.
A BRIEF STUDY OF THE POSSIBILITY OF USING PARTIAL SIMILITUDES TO ESTIMATE THE LEVEL OF IMPACT DAMAGE Final Report, Aug. 1970 - Jul. 1971
Coleman DuP. Donaldson and Brian H. Jones Jul. 1971 47 p ref
(Contract N00014-71-C-0024; ARPA Order 854)
(AD-727647; ARAP-165) Avail: NTIS CSCL 19/4

Results are presented of a preliminary study to determine the possibility of using limited or partial similitudes to determine the general level of damage that results from high-speed particle impact. Experimental results are presented and compared for four separate types of impact which satisfy a certain partial similitude. The similarity of impact damage for these conditions is discussed for both simple and compound targets. Author (GRA)

N72-10951# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
BUCKLING OF UNSTIFFENED CURVED PLATES
Charles Culver and Ghulam Nasir Apr. 1970 63 p refs
(Proj. 68-32)
(PB-200413; Rept-2438) Avail: NTIS CSCL 13M

An analytical study of the buckling behavior of the unstiffened compression flanges of horizontally curved box girders is presented. The curved plate element is assumed to be simply supported and subjected to a combination of in-plane normal and shearing stresses. The eigenvalue problem is formulated using the energy expression for the buckled plate and solutions are obtained by means of the Rayleigh-Ritz method. In inelastic range, the orthotropic nature of the plate behavior is utilized. Design recommendations for the flange dimensions required to prevent local buckling are also established. Author (GRA)

N72-10952# Ghent Univ. (Belgium). Lab. of Materials Resistance.
FATIGUE STRENGTH OF FINNED TUBES
Arnold Sys (Centre de Rech. Sci. et Tech.) Brussels Centre de Rech. Sci. et Tech. de l'Ind. des Fabric. Metal. Jul. 1971 9 p Sponsored by IRSIA
(CRIF-MT-73) Avail: NTIS

In order to evaluate the effects of welded fins on the fatigue resistance of finned mild steel tubes, fatigue and fracture tests were carried out. The number of cycles was limited to 100,000. After the tests were completed a longitudinal cut was made through the tube, and the surface was polished and etched in order to investigate the presence of fatigue cracks initiating at the discontinuities and their evolution. Some fins were broken open from the tube after cooling in liquid air. The results of the fatigue tests show that the presence of welded fins does not effect the fatigue resistance of the tube for up to 100,000 cycles. However this test did not permit the determination of the pressure which induces failure beyond 100,000 cycles. From the results of the fracture tests, it is concluded that notch effects do not induce cracks. ESRO

N72-10953# Aeronautical Research Inst. of Sweden, Stockholm.
MINIMUM WEIGHT DESIGN OF ORTHOTROPIC SANDWICH PANELS LOADED IN COMPRESSION AND SHEAR
Peter Stehlin and Lars Holsteinson 1971 76 p refs
Sponsored by Swed. Tech. Res. Council
(FFA-122) Avail: NTIS

The minimum weight configuration of rectangular orthotropic sandwich panels with fiber-reinforced plastic faces is determined. The configuration is designed to meet specified requirements with regard to strength, stability, in-plane stiffness, and minimum feasible thicknesses of core and faces. The design specifications are assumed to comprise an arbitrary number of different states of loading acting successively on the panel. Each loading state may consist of either uniaxial compression or tension, pure shear, or a combination of such loads. In order to investigate the weight efficiency of different reinforcing materials, optimum configurations are numerically determined for long sandwich panels with simply-supported edges and with faces reinforced by a) bidirectional glass fiber fabric, b) unwoven E-glass fibers, and c) boron fibers. The weight of such panels is compared with that of panels having aluminum faces, for the purpose of studying the advantages or disadvantages of aluminum and fiber-reinforced plastics as design materials in the light of different design requirements. Author (ESRO)

N72-10954*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYTICAL AND EXPERIMENTAL STUDIES OF NATURAL VIBRATIONS MODES OF RING-STIFFENED TRUNCATED-CONE SHELLS WITH VARIABLE THEORETICAL RING FIXITY
Eugene C. Naumann, Donnell S. Catherines, and William C. Walton, Jr. Washington Oct. 1971 84 p
(NASA-TN-D-6473; L-7228) Avail: NTIS CSCL 20K

Experimental and analytical investigations of the vibratory behavior of ring-stiffened truncated-cone shells are described. Vibration tests were conducted on 60 deg conical shells having up to four ring stiffeners and for free-free and clamped-free edge constraints and 9 deg conical shells, for two thicknesses, each with two angle rings and for free-free, free-clamped, and clamped-clamped edge constraints. The analytical method is based on linear thin shell theory, employing the Rayleigh-Ritz method. Discrete rings are represented as composed of one or more segments, each of which is a short truncated-cone shell of uniform thickness. Equations of constraint are used to join a ring and shell along a circumferential line connection. Excellent agreement was obtained for comparisons of experimental and calculated frequencies. Author

N72-10955# Alabama Univ. Research Inst., Huntsville.
ELASTO-PLASTIC ANALYSES OF AN ARBITRARY ANISOTROPIC LAMINATED SHELL BY THE FINITE ELEMENT METHOD
T. J. Chung and R. L. Eidson Oct. 1970 42 p refs
(Contract F44620-69-C-0124; AF Proj. 7921; Proj. THEMIS)
(AD-724716; UARI-RR-88; AFOSR-70-2865TR) Avail: NTIS CSCL 20/11

A procedure for the elasto-plastic analysis of a general anisotropic laminated shell using the finite element method is presented. A curved triangular element with linear membrane displacement and quintic normal displacement is used. The analysis approach taken is that of incremental loads with additional loads being applied to account for the effect of plasticity. The analysis is carried out in conjunction with the Huber-Mises yield criterion and the Prandtl-Reuss flow rule in accordance with the theory of a strain-hardening yield function. To account for anisotropy the yield criterion is generalized by introducing the anisotropic parameters of plasticity. These parameters, although constant within a load increment, are allowed to vary from one load increment to another as the material strain hardens. Author (GRA)

N72-10956# Norwegian Inst. of Tech., Trondheim. Inst. of Applied Mechanics.
FINITE CREEP OF CLOSED MEMBRANES OF REVOLUTION
Kare Hellan 1971 24 p refs *Its* Acta Polytech. Scand., Mech. Eng. Ser. 57
(PB-200421; APS-ME-57; UDC-539.434:624.074.4) Avail: NTIS CSCL 13M

The creep of a closed membrane shell of revolution subject to uniform pressure was investigated. Large deformation incremental theory including a nonlinear creep law was applied. A numerical analysis was carried out for initially ellipsoidal shapes and various material parameters, providing deformation patterns and critical times. Author

N72-10957# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.
AN APPLICATION OF FRACTURE CONCEPTS TO THE PREDICTION OF CRITICAL LENGTH OF FATIGUE CRACKS. PART 2: A REVIEW OF PERTINENT ASPECTS OF FRACTURE (THEORETICAL AND ANALYTICAL ASPECTS OF FATIGUE OF METALS) M. S. Thesis - Ohio State Univ., 1970 Technical Report, Jun. 1969 - Jun. 1970
Sidney O. Davis Apr. 1971 116 p refs
(AF Proj. 7351)
(AD-725028; AFML-TR-70-202-PT-2) Avail: NTIS CSCL 20/11

This part of the report (Volume 2) presents a technical documentary historical review of pertinent theoretical and analytical aspects of fatigue failure and its relationship to fracture mechanics. The review covers the period 1829 to 1970. Fatigue failure, i.e., fracture without gross plastic deformation under repeated application of stress below the proportional limit, has been recognized for at least 138 years. Despite numerous investigations on the subject, there is no available theory for correlating the many variables affecting fatigue failure and for successfully predicting failure. The application of linear elastic fracture mechanics and the thermodynamics of fracture to the crack propagation facet of fatigue is proposed as an approach to the prediction of critical lengths of stable fatigue cracking and unstable fracturing before failure. Author (GRA)

N72-10958*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THERMOELASTIC DAMPING AND ITS EFFECT ON FLUTTER OF STRESSED PANELS SITUATED IN A SUPERSONIC AIRFLOW
R. C. Shieh Washington Nov. 1971 32 p refs
(NASA-TN-D-6448; L-7563) Avail: NTIS CSCL 20K

The effects of material damping on flutter of stressed rectangular panels are studied within the context of linear thermoelasticity theory. The closed-form expression for the thermoelastic (material) damping coefficient is obtained as a function of frequency, panel temperature and dimensions, and material properties. The solution of the stability boundary value problem is obtained by use of a generalized Galerkin method in the cross stream direction which reduces the governing partial differential equations to a system of ordinary differential equations in the streamwise direction. These equations are then solved exactly. Numerical results are given for the thermoelastic damping coefficients and for the flutter speeds of partially and fully clamped panels subjected to midplane stress. Author

N72-10959# Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab.
RIDE RESPONSE OF A MODEL VEHICLE TO HARMONIC INPUTS Final Report
David Mayo McClellan May 1971 199 p refs
(Contract DAAE07-69-0356; DL Proj. 3683/423; Proj. Themis)
(AD-724704; SIT-DL-71-1532; R-1532) Avail: NTIS CSCL 13/6

The document is concerned with vehicle response to harmonic inputs. The theories of mechanical vibrations and linear systems analysis are applied to one, two, and n-dimensional lumped-parameter systems to develop an orientation to the methods of obtaining theoretical system responses. Emphasis is placed on the system transfer function, the frequency and characteristic polynomials, and the steady-state response. Subsequently, the theoretical heave and pitch responses of the sprung mass of a vehicle traveling over a harmonic wave are obtained. The vehicle is represented as a four-dimensional lumped-parameter system and is subjected to a harmonic wave input of sufficient wavelength to allow continuous tire patch contact, but short enought to induce pitch motion. A one-eight scale model of some general vehicle is tested to determine its mass, inertia, damping, and spring parameters. The model is then run on a harmonic track (no roll motion imparted), its heave and pitch accelerations of the sprung mass center of gravity measured, and a correlation made with the theoretical results.
Author (GRA)

N72-10960# Technische Hochschule Munchen (West Germany). Institut fuer Technische Mechanik.
MECHANICS OF BRITTLE MATERIALS UNDER LINEAR TEMPERATURE INCREASES Technical Report, 1 Oct. 1966 - 31 Oct. 1969
H. Neuber and A. Wimmer Wright-Patterson AFB, Ohio AFML Apr. 1971 120 p refs
(Contract AF 61(052)-875; AF Proj. 7659)
(AD-725761; AFML-TR-71-70; Task-735005) Avail: NTIS CSCL 11/2

The results of work done to show the effects of surface roughness, residual stresses, strain rate, microstructure, alternating bending fatigue loading and a non-uniform stress field on the strength of small (2.-8.mm diameter) alumina rods are given. The rods used in the work were characterized by determinations of grain size, porosity, hardness, surface roughness and damping factor. Static bend tests at room temperature are used to determine the Young's modulus, the fracture stress, and the strain at fracture and to show the influence of specimen volume on the fracture stress. The effects of grain size and of porosity on these characteristics are shown. A new tensile test specimen is designed which achieves an almost uniform stress field in the test area. Some test results are given to show the validity of this procedure for brittle specimens. Author (GRA)

N72-10961*# Boeing Co., Seattle, Wash. Commerical Airplane Group.
BUCKLING ANALYSIS FOR AXIALLY COMPRESSED FLAT PLATES, STRUCTURAL SECTIONS, AND STIFFENED PLATES REINFORCED WITH LAMINATED COMPOSITES
A. V. Viswanathan, Tsai-Chen Soong, and R. E. Miller, Jr. Washington NASA Nov. 1971 79 p refs
(Contract NAS1-8858)
(NASA-CR-1887) Avail: NTIS CSCL 20K

A classical buckling analysis is developed for stiffened, flat plates composed of a series of linked plate and beam elements. Plates are idealized as multilayered orthotropic elements. Structural beads and lips are idealized as beams. The loaded edges of the stiffened plate are simply-supported and the conditions at the unloaded edges can be prescribed arbitrarily. The plate and beam elements are matched along their common junctions for displacement continuity and force equilibrium in an exact manner. Offsets between elements are considered in the analysis. Buckling under uniaxial compressive load for plates, sections, and stiffened plates is investigated. Buckling loads are the lowest of all possible general and local failure modes, and the mode shape is used to determine whether buckling is a local or general instability. Numerical correlations with existing analysis and test data for plates, sections, and stiffened plates including boron-reinforced structures are discussed. In general correlations are reasonably good. Author

N72-10962# Air Force Systems Command, Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
TECHNIQUES FOR MEASURING DISPLACEMENT FIELDS OF DEFORMED BODIES USING HOLOGRAPHIC INTERFEROMETRY Technical Report, Sep. 1969 - Sep. 1970
Gene E. Maddux and Richard R. Corwin Mar. 1971 45 p refs
(AF Proj. 1467)
(AD-725748; AFFDL-TR-70-157) Avail: NTIS CSCL 14/2

Holographic interferometry has reached a state of practical application wherein many different structural deformations have been recorded. Some of these recordings can be interpreted by casual observation while others require a detailed mathematical analysis to convert fringe patterns into displacement data. A few investigators have proposed different mathematical models for fringe formation resulting from surface displacements. Most of these models, however, do not adequately represent realistic structures. The report is concerned with examining these approaches and devising a systematic plan of investigating displacement determination for complex structures.
Author (GRA)

N72-10963# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
SIMPLY-SUPPORTED AND CLAMPED CYLINDRICAL SHELL UNDER CONCENTRATED LOAD APPLIED TO A CENTRAL REINFORCING RING
K. Brady, Arnold Allentuch, and Joseph Kempner Mar. 1971 46 p refs
(Contract F44620-69-C-0072; AF Proj. 9782-01)
(AD-725756; PIBAL-71-6; AFOSR-71-0777TR) Avail: NTIS CSCL 13/13

The stress analysis of a circular finite shell circumferentially stiffened is presented. The stiffener is attached to the shell half way between the supports and is subjected to a radial concentrated load, a tangential concentrated load, and a concentrated moment. All of the loads are in the plane of the stiffener. Two cases of shell supports are considered, built-in and simply-supported. The stress and displacement distributions in the shell and stiffener are presented in the form of curves.
Author (GRA)

N72-10964*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DYNAMIC RESPONSES OF RAILROAD CAR MODELS TO VERTICAL AND LATERAL RAIL INPUTS
John L. Sewall, Russell V. Parrish, and Barbara J. Durling Washington Nov. 1971 97 p refs
(NASA-TN-D-6375; L-7283) Avail: NTIS CSCL 13F

Simplified dynamic models were applied in a study of vibration in a high-speed railroad car. The mathematical models used were a four-degree-of-freedom model for vertical responses to vertical rail inputs and a ten-degree-of-freedom model for lateral response to lateral or rolling (cross-level) inputs from the rails. Elastic properties of the passenger car body were represented by bending and torsion of a uniform beam. Rail-to-car (truck) suspensions were modeled as spring-mass-dashpot oscillators. Lateral spring nonlinearities approximating certain complicated truck mechanisms were introduced. The models were excited by displacement and, in some cases, velocity inputs from the rails by both deterministic (including sinusoidal) and random input functions. Results were obtained both in the frequency and time domains. Solutions in the time domain for the lateral model were obtained for a wide variety of transient and random inputs generated on-line by an analog computer. Variations in one of the damping properties of the lateral car suspension gave large fluctuations in response over a range of car speeds for a given input. This damping coefficient was significant in reducing lateral car responses that were higher for nonlinear springs for three different inputs. Author

N72-10965 National Lending Library for Science and Technology, Boston Spa (England).
THE CONCENTRATION OF STRESSES IN GROOVES OF CASTINGS OF THE PLATE TYPE
G. Sh. Kiriya and G. A. Fen 1971 7 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow)
(NLL-M-21067-(5828.4F); NLL-1211) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL Photocopy coupon

A formula was derived from the resistance of the materials for calculating normal stresses and the maximum concentration coefficient in the grooves of plate-type castings. Author

N72-10966 National Lending Library for Science and Technology, Boston Spa (England).
APPROXIMATE DETERMINATION OF THE THERMOELASTIC STRESSES IN A PLATE DURING SYMMETRICAL HEATING
V. M. Guba, Yu. S. Postolnik, and V. A. Garanchuk 1971 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 4, 1971 p 132-135
(NLL-M-21095-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method of calculating the thermoelastic stresses in a plate using an approximate solution to the equation for thermal conductivity is presented. This is based on the recognized engineering interpretation of the process of conduction of heat, which presupposes that this conduction is subdivided into delayed and regular states. Equations are given for determining the stresses. As an example, the stresses in a plate during contact heating in a medium at a constant temperature are calculated; approximate functions of temperature are obtained by meaning functional corrections. The calculation results agree well with the accurate solution. Author

N72-10967 National Lending Library for Science and Technology, Boston Spa (England).
REFINEMENT OF THE POTENTIAL SOLUTIONS OF PLANE AND AXISYMMETRIC PROBLEMS OF PLASTIC FLOW
G. Ya. Gun and P. I. Polukhin 1971 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 5, 1971 p 61-65
(NLL-M-21120-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The potential solution is employed as a zero approximation, and the methodology is described. A solution can be obtained by any numerical method, in particular by the Ritz method or by the method of local variations. Author

N72-10968 Tufts Univ., Medford, Mass.
CONSTRAINED LAYER DAMPING OF BEAMS WITH PARTIAL COVERAGE Ph.D. Thesis
David Studley Nokes 1968 146 p
Avail: Univ. Microfilms Order No. 70-16917

A theoretical and experimental study is presented on the damping of beams by constrained viscoelastic layers when only a portion of the beam is covered. The basic results of Ungar and Kerwin are extended to nonsinusoidal mode shapes and coverage of only the central portion of the beam. Both theory and experiment show that for stiff viscoelastic layers the loss factor is greater for partial coverage than for full coverage. Dissert. Abstr.

N72-10969 Rensselaer Polytechnic Inst., Troy, N.Y.
COUPLER VARIATIONS OF A HIGH SPEED SLIDER-CRANK MECHANISM Ph.D. Thesis
Peter William Jasinski 1970 111 p
Avail: Univ. Microfilms Order No. 70-19940

An analytical investigation of the vibrations associated with a planar mechanical linkage are studied. Specifically, the vibrations of a high speed slider-crank mechanism with a uniform elastic connecting bar and a rigid crank are investigated. The linearized partial differential equations with boundary conditions which describe the longitudinal and transverse vibrations of this elastic coupler are derived as a special case of an elastic four-bar linkage. Approximate solutions to these equations are found for essentially two sets of boundary conditions. The first and simplest assumes hinged-end conditions; that is, the moment and both of the elastic displacements are taken to vanish at each end of the elastic bar. The second differs from the first in that, in place of the assumption that the longitudinal vibration vanishes at the coupler's sliding-end, a concentrated mass is placed at that end and its effect is investigated. Dissert. Abstr.

N72-10970 New York Univ., N.Y.
SHAPE AND STRESS OF A SUPPORTED BALLOON Ph.D. Thesis
Morris Marvin Klein 1970 84 p
Avail: Univ. Microfilms Order No. 70-19011

The theory of large deformations of elastic surfaces is applied to determine the shape and stress distribution of an axially symmetric container deformed by the combined action of internal pressure and external support. The container, treated as an electric membrane, satisfies a pair of second order nonlinear differential equations derived for Mooney materials by the principle of virtual work. In terms of these equations, the characteristics of the container are described as the solution of a nonlinear boundary value problem. An initially undeformed shape is specified and the resulting stationary shape assumed by the container when filled with a fluid and set to rest on a planar surface is determined as a four point boundary value problem. A spherical container which is highly inflated and suspended from a point is calculated. The deformation is determined by a perturbation technique. The family of shapes that result in constant stress, fluid filled containers resting on a flat surface is also considered. Dissert. Abstr.

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N72-10971# European Organization for Nuclear Research, Geneva (Switzerland).
THERMODYNAMICS OF STRONG INTERACTIONS. LECTURES GIVEN IN THE ACADEMIC TRAINING PROGRAMME OF CERN, 1970 - 1971
R. Hagedorn 7 May 1971 137 p refs
(CERN-71-12) Avail: AEC Depository Libraries

The lectures on the thermodynamics of strong interactions cover the separation of kinematics and thermodynamics, the main principles of statistical thermodynamics, motivation of the particular structure of hadron thermodynamics, the partition function and the solution of the bootstrap condition, and the bootstrap solution. The derivation of distributions from Z(V,T), physical properties of a fireball, and conservation laws are also discussed. Applications are made to collision processes and astrophysics. NSA

N72-10972*# Scientific Translation Service, Santa Barbara, Calif.
CORRELATION OF FLAMEOUT AND IGNITION CHARACTERISTICS FOR DIFFUSION COMBUSTION OF FUEL BEHIND SYSTEMS OF ANGLE-BAR FLAMEHOLDERS [O KORRELYATSII KHARAKTERISTIK SRYVA I ZAZHIGANIYA PLAMENI PRI DIFFUZIONNOM SZHIGANII TOPLIVA ZA SISTEMAMI UGOLKOVYKH STABILIZATOROV]
V. A. Khristich and V. N. Litoshenko Washington NASA Nov. 1971 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Mashinostr. (USSR), no. 5, 1970 p 78-82
(Contract NASw-2035)
(NASA-TT-F-14012) Avail: NTIS CSCL 20M

Empirical parameters are proposed which correlate the flameout and ignition characteristics for flameholders of different width, opening angle, shape, and degree of shadowing of the burner by the flameholders. Author

N72-10973*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEUTRAL PARTICLE WAKE METHOD FOR MEASURING THE ATMOSPHERIC TEMPERATURE FROM A SATELLITE
L. H. Brace, W. R. Hoegy, F. R. Theis, and L. E. Wharton (Maryland Univ.) Jul. 1971 36 p refs
(NASA-TM-X-65736; X-621-71-376) Avail: NTIS CSCL 20M

A method is described that permits a satellite-borne neutral mass spectrometer to perform measurements of the atmospheric temperature. The method employs the spectrometer to examine the partial pressure variations that occur as the wake of a small rectangular baffle is swept across the entrance orifice of the spectrometer. For a given baffle size and mounting distance from the orifice the depth of the resulting pressure minimum depends only upon the thermal velocity, or temperature, of the observed species. A check upon the validity of the method is obtained by measuring the wake characteristics of more than one species and/or by employing each of several baffle sizes. Author

N72-10974# Naval Postgraduate School, Monterey, Calif.
PERFORMANCE CHARACTERISTICS OF ROTATING, NON-CAPILLARY HEAT PIPES M.S. Thesis
Walter Hughes Newton, Jr. Jun. 1971 61 p refs
(AD-727661) Avail: NTIS CSCL 13/1

A Nusselt-type analysis was performed for laminar film condensation on the inside of a rotating truncated cone with small half cone angles. This analysis included the interfacial shear between the vapor and condensate, the vapor pressure drop, the thermal resistance in the condenser wall, and the condenser outside cooling mechanism. An approximation of the analytical model made it possible to find a numerical solution for small half cone angles greater than zero. A non-capillary rotating heat pipe containing an evaporator, condenser, and distilled water as the working fluid was tested. It was rotated at 702 and 1404 RPM, and the heat transfer rates of the heat pipe were determined experimentally for different saturation temperatures corresponding to electrical power inputs ranging from 1 kW to 9 kW. The experimental results showed that the non-capillary rotating heat pipe was an effective heat transfer device. The approximate numerical solution conservatively predicted the heat transfer rate with a deviation of 18% at 702 RPM and 5% at 1404 RPM. Author (GRA)

N72-10975# Drexel Univ., Philadelphia, Pa.
A METHOD OF CHARACTERISTICS CODE FOR ENERGY DEPOSITION CALCULATIONS (MCDIT 3) Contract Report, 1 Jan. - 31 Dec. 1970
Shun Chen and Pei Chi Chou Mar. 1971 102 p refs
(Contract DAAD05-70-C-0175; RDT/E Proj. 1-T-061102-A-32-E)
(AD-724734; DREXEL-125-15; BRL-CR-36) Avail: NTIS CSCL 20/13

A one-dimensional method of characteristics code for the calculation of material response due to intensive in-depth energy deposition is presented. Emphasis is placed on the response within 0.1 microsecond. Shock waves are formed in the materials due to the discontinuous distribution of deposited energy. The peak pressure calculated is higher than those calculated by finite-difference codes. Author (GRA)

N72-10976# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACOUSTICAL METHOD FOR INTENSIFICATION OF THE PROCESSES OF MIXING AND COMBUSTION OF NATURAL GAS
N. V. Lavrov, E. I. Rozenfeld, Yu. A. Zhebrak, and V. G. Smolenskiy 5 Feb. 1971 21 p refs Transl. into ENGLISH from Gaz. Prom. (Moscow), v. 15, no. 2, 1970 p 27-32
(FTD Proj. 6040201)
(AD-725076; FTD-HT-23-36-71; UR/0492-70-015-002) Avail: NTIS CSCL 21/2

The effect of an acoustic field on the mixing of the injecting and injected streams in a cylindrical tube mixer was examined. A considerable intensification of the mixing process is attained which permits the shortening of the necessary mixer length by 30-60 percent. An analysis was made of the effect of the acoustic field on the burning processes in the combustion chamber. The use of the acoustic field permits a substantial broadening of the lower boundary of stable operation in the burner studied. GRA

N72-10977# Lockheed Missiles and Space Co., Palo Alto, Calif.
APPARATUS TO INVESTIGATE RADIANT HEAT EXCHANGE IN CRYOGENIC VACUUM CHAMBERS
A. G. Tkachev, A. V. Kletskii, L. N. Bolgarov, N. G. Sagaidakova, and T. I. Riabusheva [1971] 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Priborostr. (Leningrad), no. 6, 1971 p 121-123
Avail: NTIS; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The apparatus and the results are described for an experimental investigation of the heat shield efficiency of a cryogenic pump by using herringbone screens cooled by liquid nitrogen. The magnitude of the heat radiation transmission coefficient is obtained in the 0 to 2 KW/sq m range of specific radiation intensities incident on the screen for an epsilon = 0.75 absorptivity of the screen surface. Author

N72-10978*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A GENERAL STAGNATION-POINT CONVECTIVE HEATING EQUATION FOR ARBITRARY GAS MIXTURES
Kenneth Sutton and Randolph A. Graves, Jr. Washington Nov. 1971 64 p refs
(NASA-TR-R-376; L-7885) Avail: NTIS CSCL 20M

The stagnation-point convective heat transfer to an axisymmetric blunt body for arbitrary gases in chemical equilibrium was investigated. The gases considered were base gases of nitrogen, oxygen, hydrogen, helium, neon, argon, carbon dioxide, ammonia, and methane and 22 gas mixtures composed of the base gases. Enthalpies ranged from 2.3 to 116.2 MJ/kg, pressures ranged from 0.001 to 100 atmospheres, and the wall temperatures were 300 and 1111 K. A general equation for the stagnation-point convective heat transfer in base gases and gas mixtures was derived and is a function of the mass fraction, the molecular weight, and a transport parameter of the base gases. The relation compares well with present boundary-layer computer results and with other analytical and experimental results. In addition, the analysis verified that the convective heat transfer in gas mixtures can be determined from a summation relation involving the heat transfer coefficients of the base gases. The basic technique developed for the prediction of stagnation-point convective heating to an axisymmetric blunt body could be applied to other heat transfer problems. Author

N72-10979# Air Force Systems Command, Edwards AFB, Calif. Rocket Propulsion Lab.
INTRODUCTORY GUIDE TO EXPLOSIVES, HANDLING

AND DEVICES

R. M. Zeek Apr. 1971 60 p refs
(AD-725706; AFRPL-TR-71-30) Avail: NTIS CSCL 19/1

Material presented in this publication is offered as an introduction to the handling of explosives and to explosive devices. The information is directed primarily to those unfamiliar with explosives and is also intended as a review for those engaged in frequent care and movement of explosives. The material is not to be considered as complete or authoritative. Where detailed information is necessary, the proper authority has been referenced. In all cases, safety officers should be consulted. Author (GRA)

N72-10980 National Lending Library for Science and Technology, Boston Spa (England).

THE INFLUENCE OF RECTANGULAR ROUGHNESS ON HEAT TRANSFER AND PRESSURE DROP IN TURBULANT ANNULAR FLOW

G. Feurstein 19 Aug. 1971 25 p refs Transl. into ENGLISH from Waerme Stoffuebertrag. (West Germany), v. 2, 1969 p 19-30
(NLL-CE-Trans-5419-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL Photocopy Coupons

Stanton numbers and friction factors for air-cooled annuli having electrically heated, roughened inner tubes with various roughness pitches and heights were obtained in a Reynolds number range of 20,000 to 200,000. The rough to smooth annulus Stanton numbers as a function of the pitch to height ratio attain a maximum and this is seen to occur when the pitch is 7 to 12 times the height, depending on height and Reynolds number. Optimum values for the rough to smooth friction factors show the same tendency, lying between a pitch to height ratio of 8 and 11. The flow patterns which occurred between the ribs when a fluid flowed over the roughness of rectangular shape through the annuli were observed in a water model. Laminar flow as well as turbulent flow up to Re = 60,000 was investigated. Author

N72-10981 National Lending Library for Science and Technology, Boston Spa (England).

HEAT TRANSFER MEASUREMENTS IN RECTANGULAR DUCTS WITH ASYMMETRICALLY HEATED WALLS

E. Hicken 19 Aug. 1971 12 p refs Transl. into ENGLISH from Waerme Stoffuebertrag (West Germany), v. 1, 1968 p 185-189
(NLL-CE-Trans-5418-(9022.09)) Avail: Natl. Lending Library Boston Spa, Engl.: 2 NLL photocopy coupons

Test results to determine the heat transfer in electrically heated rectangular ducts (aspect ratio 1:1 and 1:3) are reported. Arbitrary variation of the heat-flux density of each of the four duct walls was possible. The measurements were made within the range of Reynolds numbers between 10,000 and 140,000. The variation of wall temperature was determined. The Nusselt number, formed with the average temperature differences of the heated walls, is in good agreement with relationships used previously. On the other hand, the local temperature differences may exceed the average value by as much as 50%. Author

N72-10982 Purdue Univ., Lafayette, Ind.

PRESSURE AND INITIAL FUEL TEMPERATURE EFFECTS ON LIQUID PROPELLANT COMBUSTION INSTABILITY

Ph.D. Thesis
Richard Ronald Weiss 1970 241 p
Avail: Univ. Microfilms Order No. 70-18771

An experimental program was conducted with a small-scale rocket engine thrust chamber assembly using bi-phase propellants. The method of experimental investigation was to conduct numerous experiments with a variety of injector configurations in which the chamber pressure and initial fuel temperature were systematically varied. The results were used to establish experimental trends that would predict combustion stability behavior as influenced by pressure and fuel temperature. A total of 115 tests were conducted in the experimental program. It was found that: (a) increasing chamber pressure generally has a strongly stabilizing effect on the combustion dynamics; and (b) increasing the initial fuel temperature exhibited a slightly destabilizing influence on the combustion dynamics. General agreement was found between the experimental results and the analytical predictions. Dissert Abstr.

34 GENERAL

Includes information of a broad nature related in industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N72-10983# American Inst. of Physics, New York. Information Div.

NISPA CUMULATIVE BIBLIOGRAPHY

May 1971 16 p refs
(Grant NSF GN-863)
(PB-201047; AIP-ID-71-1) Avail: NTIS CSCL 05B

The National Information System for Physics and Astronomy was designed and implemented by the Information Division, American Institute of Physics, with the support of the National Science Foundation. The reports and publications of the Division, and related publications of the American Institute of Physics, are listed. Author (GRA)

N72-10984*# Lockheed-California Co., Burbank. Science and Engineering Branch.

STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTATION SYSTEMS, VOLUME 1 Final Report, Jun. 1970 - May 1971

E. G. Stout, P. H. Kesling, H. C. Matteson, D. E. Sherwood, W. R. Tuck, Jr., and L. A. Vaughn Jun. 1971 173 p 4 Vol.
(Contract NAS2-5989)
(NASA-CR-114340) Avail: NTIS CSCL 05C

An analysis of an effective short range, high density computer transportation system for intraurban systems is presented. The seven county Detroit, Michigan, metropolitan area, was chosen as the scenario for the analysis. The study consisted of an analysis and forecast of the Detroit market through 1985, a parametric analysis of appropriate short haul aircraft concepts and associated ground systems, and a preliminary overall economic analysis of a simplified total system designed to evaluate the candidate vehicles and select the most promising VTOL and STOL aircraft. Data are also included on the impact of advanced technology on the system, the sensitivity of mission performance to changes in aircraft characteristics and system operations, and identification of key problem areas that may be improved by additional research. The approach, logic, and computer models used are adaptable to other intraurban or interurban areas. E.H.W.

N72-10985*# Lockheed-California Co., Burbank. Science and Engineering Branch.

STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTATION SYSTEMS, VOLUME 2 Final Report, Jun. 1970 - May 1971

E. G. Stout, P. H. Kesling, H. C. Matteson, D. E. Sherwood, W. R. Tuck, Jr., and L. A. Vaughn Jun. 1971 198 p 4 Vol.
(Contract NAS2-5989)
(NASA-CR-114341) Avail: NTIS CSCL 05C

A cost analysis of the major items of direct operating costs in an intraurban aircraft transportation system are presented. The results are given in the form of tables and graphs. E.H.W.

N72-10986*# Lockheed-California Co., Burbank. Science and Engineering Branch.

STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTA-

TION SYSTEMS, VOLUME 3 Final Report, Jun. 1970 - May 1971
E. G. Stout, P. H. Kesling, D. E. Matteson, D. E. Sherwood, W. R. Tuck, Jr., and L. A. Vaughn Jun. 1971 209 p refs 4 Vol.
(Contract NAS2-5989)
(NASA-CR-114342) Avail: NTIS CSCL 05C

An investigation of three aircraft concepts, deflected slipstream STOL, helicopter VTOL, and fixed wing STOL, is presented. An attempt was made to determine the best concept for the intraurban transportation system. Desirability of the concept was based on ease of maintenance, development timing, reliability, operating costs, and the noise produced. Indications are that the deflected slipstream STOL is best suited for intraurban transportation. Tables and graphs are included. E.H.W.

N72-10987*# Lockheed-California Co., Burbank. Science and Engineering Div.
STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTATION SYSTEMS. VOLUME 4: APPENDIX Final Report, Jun. 1970 - May 1971
E. G. Stout, P. H. Kesling, H. C. Matteson, D. E. Sherwood, W. R. Tuck, Jr., and L. A. Vaughn Jun. 1971 273 p 4 Vol.
(Contract NAS2-5989)
(NASA-CR-114343) Avail: NTIS CSCL 05C

An appendix of the supporting data leading to conclusions and recommendations for an effective intraurban transportation system from volumes 1, 2, and 3 is presented. The data are given in tables and graphs. E.H.W.

N72-10988*# Southeastern State Coll., Durant, Okla. Technology Use Studies Center.
TECHNOLOGY UTILIZATION IN A NON-URBAN REGION: FURTHER IMPACT AND TECHNIQUE OF THE TECHNOLOGY USE STUDIES CENTER, 2 Final Report
Henry C. Gold, ed., A. M. Moore, Bill Dodd, and Velma Dittmar May 1971 36 p refs
(Contract NSR-37-004-009)
(NASA-CR-123292) Avail: NTIS CSCL 05B

The clientele served by the Technology Use Studies Center (TUSC) is updated. Manufacturing leads the list of client firms. The standard industrial classification (SIC) range of these firms is broad. Substantial numbers of college and university faculties are using TUSC services. Field operations inherent in the functions of dissemination and assistance are reviewed. Increasing emphasis among clientele is on environmental concerns and management. A record is provided of the institutions contacted and the extent of TUSC involvement with them, as well as TUSC's cooperation with agencies and organizations. The impact of TUSC and the NASA-sponsored Technology Utilization Program on other public agencies is discussed. Author

N72-10989# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
A TEXT OUTPUT SYSTEM FOR PRODUCTION OF REPORTS AND MANUALS
D. Schofield and B. A. Wichmann Aug. 1971 19 p
(NPL-DNAC-5) Avail: NTIS

A page format output scheme for generating text documents such as manuals or reports is described. Paragraphing, contents lists, index generation, titles, footnotes and other facilities are handled thrbugh control characters inserted into the text, and the making up into lines and pages is performed automatically. Together with any existing editing package this provides a means of preparing and updating documents with a minimum of manual retyping. The use of the scheme on KDF9 is described. Author (ESRO)

N72-10990# American Inst. of Physics, New York. Physics Information Div.
THE AIP PROGRAM FOR PHYSICS INFORMATION: A NATIONAL INFORMATION SYSTEM FOR PHYSICS AND ASTRONOMY, 1972 - 1976 Annual Report
Jun. 1971 74 p refs
(Grants NSF GN-863; NSF-GN-864; NSF-GN-865)
(PB-200991; ID-71P) Avail: NTIS CSCL 05B

Described are: (1) A systems concept-goals, priorities, and strategy; (2) A system for selected current physics information; (3) System development and future projections; (4) The American Institute of Physics and the AIP Physics Information Division; (5) Developemnt of computer programming. GRA

N72-10991# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
PERSONNEL MANAGEMENT: HUMAN RESOURCES RESEARCH
James L. Quinn Mar. 1971 103 p refs
(AD-727030; SLTR-3-71) Avail: NTIS CSCL 05/9

Human resources have long been recognized as the most important asset of any organization. The potential value to be gained from a better understanding of the human processes and an application of this knowledge to the improved utilization of manpower resources within the organizational environment has led to a vast amount of human resources research within recent years. The report addresses aspects of personnel research relating primarily to the study of job factors within the work setting itself, as well as discussing the factors underlying human relationships and with the information technology facilitating these interrelationships within the organization. It offers an integrative, systems approach to manpower management, describing how the research and information subsystem of the manpower management system can significantly contribute to utilization of the human resources employed in attaining organizational objectives. Author (GRA)

N72-10992# Institute for Defense Analyses, Arlington, Va.
COST GROWTH AND PRODUCTIVITY IN EUROPEAN AEROSPACE DEVELOPMENT PROGRAMS
Rolf Piekarz and Susan McIntosh Dec. 1970 74 p refs
(Contract DAHC15-67-C-0011)
(AD-725478; RP-P-684; IDA/HQ-71-12266; T-73) Avail: NTIS CSCL 05/3

The paper reports on an exploratory study to obtain tentative estimates about two aspects of European aerospace systems development costs in comparison to the U.S. experience: the percentage cost growth occurring during the program, and the absolute costs in dollar terms of foreign projects relative to costs of comparable U.S. projects. Eight major European commercial and military aerospace programs were investigated during the 1962-1969 period, and the cost outcomes of these programs were compared to the overall U.S. experience. The tentative findings suggest that proposals to adopt foreign organization, such as nationalization, to improve U.S. military technology development performance are unlikely to solve U.S. difficulties, and that applying U.S. cost models to evaluate foreign military RDT and E efforts is not recommended for estimating the outputs and size of foreign programs. GRA

N72-10993# Systems Science and Software, La Jolla, Calif.
EFFECTS OF PROJECTILE SHAPE ON THIN PLATE PERFORATION AT NORMAL INCIDENCE
R. T. Sedgwick and J. M. Walsh May 1971 64 p refs
(Contract DAAG07-68-C-0931; RDT/E Proj. 1-T-650212-D-620)
(AD-725732; BRL-CR-38; Rept-3SR-348) Avail: NTIS CSCL 19/1

Analytical, numerical and experimental results are compared in a systematic investigation of the effects of projectile shapes on thin plate perforation. The analysis of five low velocity impact involving optimal-, ogival-, Russian-, conical- and cylindrical-head projectile comprise the study. A three-way comparison of simple perforation theory predictions, HELP numerical solutions and available experimental data is made for the five problems. The HELP solutions are in excellent agreement with the experimental data. Although the simple perforation formulas are sensitive to projectile shape, they do not provide adequate residual energy predictions. Further numerical studies of this type should provide additional insight into the penetration process and eventually lead to improved perforation formulas. Author (GRA)

N72-10994# National Bureau of Standards, Washington, D.C. Systems Development Div.

A SURVEY OF SELECTED DOCUMENT PROCESSING SYSTEMS

Elizabeth Fong Oct. 1971 68 p refs
(NBS-TN-599; Rept-640-1137) Avail: SOD $0.65 Order No. C 13.46:599

General characteristics of available, large document processing systems are explored. A list of features, as a set of dimensions, is defined for comparing these systems. An overview of eight systems is presented namely: CIRCOL, DDC ITIRC, The Mead Data Central, MEDLARS 2, New York Times Information Bank, ORBIT 2, and RECON/STIM. The description of the eight systems is included which are surveyed according to the feature list outline. This feature list also provides a reference tool for the systems. E.M.C.

N72-10995# Environmental Protection Agency, Washington, D.C.

REALITY BEFORE RHETORIC IN THE ENVIRONMENTAL MOVEMENT

William D. Ruckelshaus 1971 12 p Presented at the Audubon Soc., Milwaukee, 22 May 1971

The aims and accomplishments of the Environmental Protection Agency are discussed. Proposed legislation is considered. K.P.D.

N72-10996# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

ENGINEERING RESEARCH ON ELECTRICAL DEVICES, CIRCUITRY, AND CONTROLS Semiannual Research Summary (13th), Jun. - Nov. 1970

Dec. 1970 134 p refs
(Contract N00014-67-A-0226-0004)
(AD-724796) Avail: NTIS CSCL 09/3

Contents: Bioengineering; Automatic controls; Energy sources and systems; Electromagnetic fields; Communication sciences; Nonlinear circuits and systems; Computers and automata; Solid state devices and materials. GRA

N72-10997# Illinois Univ., Urbana. Materials Research Lab.

THE SCIENCE OF MATERIALS Annual Progress Report

15 Apr. 1971 73 p refs
(Contract AT(11-1)-1198)
(COO-1198-808) Avail: NTIS

Progress is reported in the following fields: (1) structure of materials (solid state transformations, electronic structure, dislocations, phase transformations, acoustic emission in stress corrosion cracking, annealing of cold-worked metals, NMR studies, thin films, nature of solid solutions of metals); (2) solid state and crystal physics (very high pressure, anharmonic effect, defects, noble gas crystals, NMR, refractory materials); and (3) energetic particle interaction (radiation damage). Author

SUBJECT INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 10 NUMBER 1

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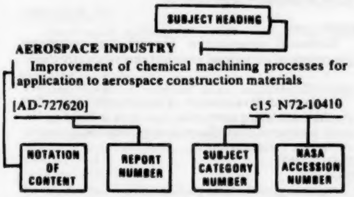
SUBJECT HEADING
AEROSPACE INDUSTRY
Improvement of chemical machining processes for application to aerospace construction materials
[AD-727620] c15 N72-10410
NOTATION OF CONTENT
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A

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[AD-727795] c05 N72-10115
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[AD-726755] c05 N72-10124
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[AD-727451] c12 N72-10238
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[NASA-CASE-GSC-11215-1] c09 N72-10192
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[AD-725001] c09 N72-10197
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[NLL-TRANS-746-840-[9022.401]]
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[AD-725043] c27 N72-10821
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[NASA-CR-1768] c14 N72-10401
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[NASA-CR-114340] c34 N72-10984
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[PB-200996] c13 N72-10334
Theoretical and experimental study of concentration profile of cesium ions injected into crystalline aluminum
c24 N72-10703

CONDENSATION
Condensation effect on mass transfer from vapor-gas mixtures to nuclear power reactor walls
c22 N72-10581

CONDITIONING [LEARNING]
Effects of low CO concentrations on learned behavior patterns using human subjects
[AD-727510] c04 N72-10088

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[CEA-N-1415] c22 N72-10558

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[AD-725732] c34 N72-10993

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Investigating natural vibration modes of ring-stiffened truncated-cone shells with variable theoretical ring fixity
[NASA-TN-D-6473] c32 N72-10954

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Process for making Rf shielded cable connector assemlies and structures formed in connection with process
[NASA-CASE-GSC-11215-1] c09 N72-10192

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[AD-727620] c15 N72-10410
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CONTINUOUS WAVE RADAR
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[NASA-TN-D-6429] c19 N72-10504
Characteristic analysis of magnetic field contraction using integral transformations
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CONTROL EQUIPMENT
Control device for simulating-charge and discharge cycle of battery in synchronous orbit
[NASA-CASE-GSC-11211-1] c03 N72-10066
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COLIBRI - computer code for analyzing rod bundle mechanisms
[CONF-710317-1] c22 N72-10544
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[WCAP-3017-5094] c22 N72-10573

CONTROL SIMULATION
Measurement of pilot stress in simulated aircraft control tasks
c05 N72-10131

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Impinging inclined jet effect on aerodynamic characteristics of control surface in VTOL longitudinal stability
c01 N72-10011
Launch phase wind models, pitch and lateral equations, and high-altitude abort simulations for delta winged, two-stage space shuttle control system studies
[NASA-CR-1900] c31 N72-10942
Control requirements and systems for delta winged two-stage space shuttle vehicles
[NASA-CR-1899] c31 N72-10945

CONTROL THEORY
Mathematical model for stability and control of legged locomotion systems
[AD-727806] c05 N72-10113
Users manual for Variable dimension Automatic Synthesis Program [VASP] designed for optimization of control theory problems
[NASA-TM-X-2417] c08 N72-10190
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[UDC-62-50] c10 N72-10207
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[AD-727675] c10 N72-10214
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NUCLEAR REACTORS
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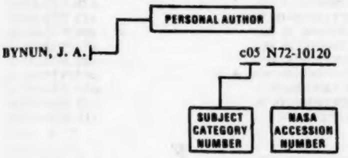

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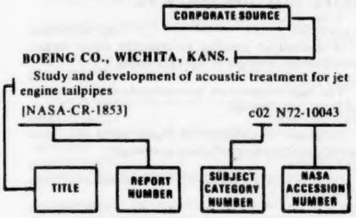
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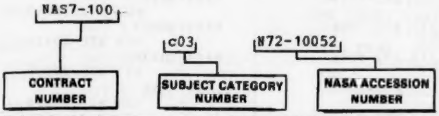

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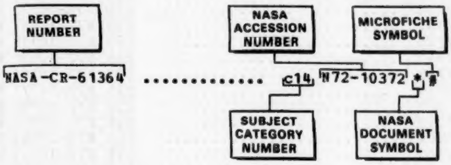

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CONF-710607-144	c25	N72-10744 #
COO-535-620	c24	N72-10672 #
COO-1198-808	c34	N72-10997 #
COO-1721-46	c14	N72-10380 #
CR-156	c29	N72-10835 #
CRIF-MT-73	c32	N72-10952 #
CSDL-R-655	c13	N72-10342 #
CTO-759	c25	N72-10773 #
D-0111	c24	N72-10681 #
D3-8535	c02	N72-10043*#
D69/70	c22	N72-10563 #
DASA-NWER-EA-091	c08	N72-10185 #
DASA-NWER-EA-094	c08	N72-10185 #
DASA-2608	c13	N72-10354 #
DASA-2685	c13	N72-10337 #
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DESY-71/19	c24	N72-10616 #
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DH/FO-1030/70-LCR/DR-5	c08	N72-10181 #
DIA-T65-05-20A	c21	N72-10541 #
DIA-T68-01-02	c18	N72-10487 #
DIA-T68-01-82	c15	N72-10408 #
DIA-T68-01-83	c15	N72-10408 #
DIA-T69-04-9	c26	N72-10796 #
DIA-T70-01-03	c32	N72-10949 #
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DK-539.126.34	c24	N72-10659 #
DLR-MITT-70-28	c01	N72-10004 #
DMS-DR-1115	c31	N72-10936*#
DMS-DR-1125	c31	N72-10929*#
DMS-DR-1139-VOL-1	c31	N72-10933*#
DMS-DR-1139-VOL-2	c31	N72-10934*#

DMS-DR-1139-VOL-3 .... c31 N72-10931*#
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DMS-DR-1152 .... c31 N72-10941*#
DMS-DR-1153 .... c31 N72-10932*#
DMS-DR-1155 .... c31 N72-10937*#
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DPH-PEC-SCP .... c24 N72-10645 #

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DR-1649 .... c17 N72-10442 #
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ERI-85500 .... c13 N72-10347 #

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Implantable Biotelemetry Systems (NASA SP–5094)

By THOMAS B. FRYER

A technology utilization report from Ames Research Center. The last decade has seen major advances in the use of radiotelemetry in physiological research. Revolutionary developments in microelectronics are making possible smaller telemetry systems that can be wholly implanted in laboratory animals. Ames Research Center has been in the forefront of development of implanted biotelemetry as a standard technique for physiological monitoring of animals, and this review of work at the Center traces the evolution of the concepts underlying today's accurate and reliable systems. The developments are described in sufficient detail for the reader to choose designs to meet specific needs. *Paperbound.* 120 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402, for $0.55.

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